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Patent Application Transmittal

(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

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ASSISTANT COMMISSIONER FOR PATENTS  
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Sir:

With reference to the filing in the United States Patent and Trademark Office  
of an application for patent in the name(s) of:

Tomohisa SHIGA, Hideo TERASAWA, Yasuaki YAMAGISHI

entitled:

ELECTRONIC PROGRAM GUIDE SYSTEM USING IMAGES OF REDUCED SIZE TO IDENTIFY  
RESPECTIVE PROGRAMS

X Continuing Application

X Continuation      Divisional      Continuation-in-Part (CIP)  
of prior application serial no. 08/684,387, filed July 19, 1996.

[Note: If priority under 35 U.S.C. 120 involves a series of respectively copending  
applications, then in this amendment identify each and its relationship to its immediate  
predecessor.]

X The prior application is assigned of record to SONY CORPORATION, at  
Reel No. 8309, Frame No. 0042, and recorded on December 27, 1996.

The following are enclosed:

X Specification ( 56 pages)

X 27 Sheet(s) of Drawings

X 20 Claim(s) (including 1 independent claim(s))

     This application contains a multiple dependent claim

X Our check for \$ 760.00, calculated on the basis of the claims  
existing in the prior application (less any claims canceled herein) as  
amended by any enclosed preliminary amendment as follows:

Basic Fee, \$760.00 (\$380.00)	\$ 760.00
Number of Claims in excess of 20 at \$18.00 (\$9.00) each:	-0-
Number of Independent Claims in excess of 3 at \$78.00 (\$39.00) each:	-0-
Multiple Dependent Claim Fee at \$260.00 (\$130.00)	-0-
Total Filing Fee	\$ 760.00

     Assignment Recording Fee \$40.00 -0-

     This application is being filed within the month following the  
expiration of the term originally set therefor in the prior application.  
This is a petition to request a -month extension of time. A check  
covering the cost of the petition is enclosed.

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450100-3598.1

X Oath or Declaration and Power of Attorney

       New        signed        unsigned

X Copy from a prior application (37 C.F.R. 1.63(d))

Deletion of Inventors

       Signed Statement attached deleting inventor(s) named in the prior application (37 C.F.R. 1.63(d)(2) and 1.33(b))

Power of Attorney or Correspondence Address Change

X Power of attorney and/or correspondence address was changed during prosecution of the prior application. The new power of attorney is to William S. Frommer, Reg. No. 25,506. The new correspondence address is indicated above.

X Incorporation by Reference (for continuation or divisional application) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

       A Preliminary Amendment is enclosed.  
(Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application.)

X Cancel in this application original claims 1-39 and 60-86 of the prior application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

X New formal drawings are enclosed.

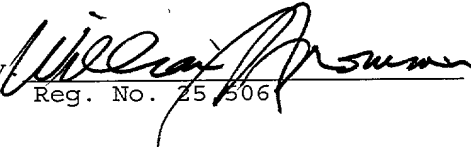
X Certified copy of each foreign priority application on which the claim for priority under 35 U.S.C. 119 is based was filed in prior U.S. application serial no. 08/684,387, filed July 19, 1996. A list of said foreign priority application(s) is provided below. Acknowledgement thereof is requested.

<u>Application No.</u>	<u>Filed</u>	<u>In</u>
07-183929	20 July 1995	Japan

Please charge any additional fees required for the filing of this application or credit any overpayment to Deposit Account No. 50-0320.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP  
Attorneys for Applicants  
WILLIAM S. FROMMER

By   
Reg. No. 25,506

PATENT  
450100-3598.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR LETTERS PATENT

TITLE: ELECTRONIC PROGRAM GUIDE SYSTEM USING  
IMAGES OF REDUCED SIZE TO IDENTIFY  
RESPECTIVE PROGRAMS

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PATENT  
450100-3598

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
APPLICATION FOR LETTERS PATENT

**TITLE:** ELECTRONIC PROGRAM GUIDE SYSTEM USING IMAGES OF  
REDUCED SIZE TO IDENTIFY RESPECTIVE PROGRAMS

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BACKGROUND OF THE INVENTION

This invention relates to a technique for transmitting and receiving electronic program guide (EPG) data and, more particularly, to such a technique which permits a user to view, readily understand and select a desired one of several programs, such as television programs, that presently are being transmitted and that will be transmitted to the user's receiving apparatus.

Electronic program guides have been proposed wherein information, known as EPG data, representing different television programs that may be received by a user is transmitted over the same medium that is used to transmit the television programs themselves. For example, recently introduced satellite transmission systems, commercially available as Direct Satellite Broadcast Systems (DSS), provide a user with the ability to selectively receive one of a multiple of different broadcast channels, each of which has different television programming transmitted thereover. Typically, the user subscribes to a DSS provider and, depending upon the user's selection, different broadcast channels may be received from that provider. Some of these broadcast channels are used to transit what has become known as "premium" television programming; and depending upon subscription rates, subscription plans, and the like, a user may receive such premium television programming as well as special events, first-run movies, and the like. For example, with a single satellite dish receiver, a DSS subscriber presently may

1 receive on the order of about 80 broadcast channels, each  
2 providing different television programming, movies, special  
3 events. etc.

4 EPG data systems have been proposed, wherein EPG data  
5 relating to each of the programs that may be transmitted on each  
6 of the broadcast channels for a period of time (for example,  
7 television program information for the next hour, several hours,  
8 days, weeks, etc.) are transmitted. The EPG data may be  
9 transmitted in-band (on the same broadcast channel as the  
10 program) or out-of-band (on a separate broadcast channel not  
11 normally used to carry programs). Such EPG data heretofore has  
12 been in the form of text data only, thereby providing the user  
13 with an EPG display of those television programs that are  
14 transmitted on respective broadcast channels for a given period  
15 of time. Once provided with this television program information,  
16 the user then may tune his television receiving apparatus to a  
17 desired broadcast channel at the proper time so as to receive the  
18 selected program. Often, a user may not readily appreciate the  
19 content of a particular television program simply from its  
20 displayed title. Also, a user may need more information, other  
21 than a simple title, to fully appreciate the type of television  
22 programs that are available in order to make an informed  
23 selection.

OBJECTS OF THE INVENTION

Therefore, it is an object of the present invention to provide an approved EPG technique which provides a user with adequate information relating to television programs (or other types of programs) that may be received.

Another object of this invention is to provide an improved EPG technique wherein the EPG data includes image data representing images of reduced, less than normal, size to identify respective programs which can be received.

A further object of this invention is to provide an improved EPG technique wherein the EPG data also includes text data representing information associated with each of the programs that presently are being transmitted and that will be transmitted and may be received by the user, the text data being selectively displayed as a table which provides a useful guide relating to several programs or as descriptive information relating to only a selected one of those programs.

An additional object of this invention is provide an improved EPG technique wherein EPG information is displayed as a plurality of reduced size images representing programs that presently are being transmitted and/or that will be transmitted, the reduced size images being superimposed onto a displayed program then being received.

Still another object of this invention is to provide a technique, as aforementioned, wherein receiving apparatus may be

1 tuned quickly to a desired broadcast channel carrying a program  
2 which is identified by one of several concurrently displayed  
3 reduced size images.

4 Various other objects, advantages and features of the  
5 present invention will become readily apparent from the ensuing  
6 detailed description, and the novel features will particularly  
7 pointed out in the appended claims.

8 SUMMARY OF THE INVENTION

9 In accordance with this invention, an electronic  
10 program guide (EPG) which identifies programs that are to be  
11 transmitted is itself transmitted in the form of EPG data which  
12 includes image data representing images of reduced, less than  
13 normal size to identify respective programs. The EPG data is  
14 combined with current program data then being broadcasted, and  
15 the combined data is transmitted. At the receiver, the EPG data  
16 is separated from the program data and the reduced size images of  
17 the EPG data are displayed in superposition over a program on the  
18 particular broadcast channel which a user may select.

19 As an aspect of this invention, the EPG data includes  
20 text data representing information associated with each program  
21 that is identified by the reduced size image data. For instance,  
22 and as an illustrative numerical example, if program data  
23 transmitted over 80 different broadcast channels may be received,  
24 the EPG image and text data identify each program that is  
25 transmitted over each of the 80 channels for a given period of



1 time (e.g., for the next hour, for the next several hours, for  
2 the next day, for the several days, etc.). In addition to  
3 displaying the images of reduced size, the user may select the  
4 text data for display. Such text data may be displayed as a  
5 table representing the programs that may be received over the  
6 different broadcast channels for the given period of time, or the  
7 text data may represent more detailed information concerning any  
8 single program that may be selected by the user.

9 As a feature of this invention, the reduced size images  
10 are single frame images that may be specially created to identify  
11 each program or, alternatively, that may be selected from the  
12 video frames normally constituting the respective programs.

13 BRIEF DESCRIPTION OF THE DRAWINGS

14 The following detailed description, given by way of  
15 example and not intended to limit the present invention solely  
16 thereto, will best be understood in conjunction with the  
17 accompanying drawings in which:

18 Fig. 1 is a block diagram of a transmission system  
19 which incorporates the present invention;

20 Fig. 2 is a block diagram of a portion of the apparatus  
21 shown in Fig. 1;

22 Fig. 3 illustrates a promotion channel display derived  
23 from the promotion channel transmitted by the apparatus shown in  
24 Fig. 1;

1           Fig. 4 illustrates the EPG display produced by the  
2 present invention;

3           Fig. 5 illustrates the title bar shown in Fig. 4;

4           Fig. 6 illustrates the reduced size images which are  
5 displayed as EPG data in accordance with the present invention;

6           Fig. 7 illustrates EPG image and text display;

7           Fig. 8 illustrates a portion of the program table  
8 display derived from the EPG data transmitted by the present  
9 invention;

10          Fig. 9 illustrates a program table display for one  
11 broadcast channel;

12          Fig. 10 illustrates a program content display derived  
13 from the EPG data which is transmitted in accordance the present  
14 invention;

15          Figs. 11A and 11B schematically illustrate the program  
16 table data and the program content data which are transmitted by  
17 normal broadcast channel transponders and by promotional channel  
18 transponders, respectively;

19          Fig. 12 schematically illustrates the EPG data  
20 transmitted by the normal broadcast channel transponders and the  
21 promotional channel transponder;

22          Fig. 13 is illustrative of the EPG data;

23          Fig. 14 illustrates the data structure of the service  
24 description table included in the EPG data;

1           Fig. 15 illustrates the data structure of the event  
2 information table included in the EPG data;

3           Fig. 16 illustrates the data structure of still picture  
4 data;

5           Fig. 17 illustrates the data structure of the time and  
6 data table included in the EPG data;

7           Fig. 18 illustrates the data structure of the program  
8 map table included in the EPG data;

9           Fig. 19 illustrates the data structure of the program  
10 association table included in the EPG data;

11           Fig. 20 illustrates a video receiving system which  
12 incorporates the present invention;

13           Fig. 21 is a block diagram of the electrical  
14 connections shown in Fig. 20;

15           Fig. 22 illustrates the receiver/decoder 2 of Fig. 20;

16           Fig. 23 is a block diagram of one embodiment of a  
17 receiver/decoder in accordance with the present invention;

18           Fig. 24 illustrates a remote control device which  
19 utilizes the present invention;

20           Fig. 25 illustrates an alternative embodiment of a  
21 portion of the remote control device shown in Fig. 24;

22           Fig. 26 is a schematic representation of a portion of  
23 the remote control device shown in Fig. 24;

Fig. 27 schematically represents the manner in which EPG data is transmitted and received in accordance with the present invention; and

Fig. 28 is a block diagram of the manner in which EPG data is stored and retrieved at the receiver shown in Fig. 23.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference numerals are used throughout to identify similar elements, and in particular to Fig. 1, there is illustrated a block diagram of one embodiment of a transmission system which incorporates the present invention. In this embodiment, electronic program guide (EPG) data and program data are transmitted from, for example, a suitable ground station to a satellite from which the EPG and program data are distributed to compatible receiving devices. Although the embodiments illustrated herein are described in conjunction with satellite transmission systems, such as direct video broadcast (DVB), DSS and other satellite systems, it will be readily appreciated that the teachings of this invention are equally applicable to the transmission of program and EPG data via conventional over-the-air broadcast systems (such as VHF and UHF systems), cable television systems, and the like. For convenience, however, Fig. 1 is illustrated and described in conjunction with satellite transmission systems wherein a satellite is provided with a plurality of transponders, each of which is operable to transmit several broadcast channels of

1 program data. For example, each transponder may be operable to  
2 transmit ten broadcast channels (e.g., PBS, NBC, HBO, etc.), but  
3 for convenience and simplification, each transponder is described  
4 herein as transmitting five broadcast channels. Also, and as  
5 will be explained, a separate transponder, described as a  
6 promotion channel transponder, is dedicated to the transmission  
7 of two or more promotion channels. Again, for convenience, while  
8 the promotion channel transponder is described as being operable  
9 to transmit only two promotion channels, it will be readily  
10 appreciated that a greater number of promotion channels may be  
11 transmitted thereby.

12 Digital video and audio program data (V/A) provided for  
13 transmission by each of several broadcast channels are supplied  
14 to a switcher 301. The video and audio program data are referred  
15 to as program data; and it will be appreciated that such program  
16 data constitutes a television program provided by conventional  
17 television stations, such as PBS, NBC, TBS, and the like. The  
18 television stations with which the present invention finds ready  
19 application are not limited solely to those television stations  
20 which operate in the United States; and Fig. 1 illustrates  
21 several different television stations which are located in the  
22 United States, Japan and elsewhere. It will also be appreciated  
23 that the program data provided by one of these broadcast channels  
24 need not be limited to television programming; and,  
25 alternatively, such program data may be suitable program

1 information produced by other types of data bases. Accordingly,  
2 it will be understood that, as used herein, "program data" refers  
3 to television programming as well as such other types of program  
4 information produced by other data bases.

5 Switcher 301 is coupled to a program control device 308  
6 which controls the switcher to divide the program data supplied  
7 thereto via respective broadcast channels into groups of  
8 broadcast channels. Each such broadcast channel carries the  
9 aforementioned program data which currently is being transmitted.  
10 Assuming that the program data transmitted on a respective  
11 broadcast channel contains video and audio data, each group of  
12 five broadcast channels is coupled to a respective MPEG encoder  
13 301-1, 303-2, . . . 303-7 wherein the video and audio data are  
14 compressed in accordance with the known MPEG standard. Program  
15 control device 308 also controls switcher 301 to couple two  
16 broadcast channels to a promotion channel generator 302 which is  
17 described in greater detail in connection with Fig. 2. Suffice  
18 it to say that the promotion channel generator operates to  
19 produce promotion program data which, as will be described,  
20 differs from the broadcast channel program data primarily in that  
21 the promotion channel program data consists of single frame video  
22 data used to promote particular broadcast channels which carry  
23 television program data that may be of special interest. The  
24 promotion channel program data may be thought of as special  
25 advertising data that may be prepared by special sponsors; and

1 the transmission of such promotion program data over the selected  
2 promotion channels is a service purchased by such sponsors.

3 EPG data is generated by an EPG data generator 309 and  
4 is formed of image data representing viewable images of reduced  
5 size (EPG 1) and text data (EPG 2 and EPG 3, to be described).  
6 In one embodiment, the EPG image data is separately generated and  
7 stored (not shown) as a single frame of video data representing  
8 an image that is typical of a respective program. For example,  
9 if the transmission system shown in Fig. 1 is operable to  
10 transmit 80 broadcast channels of program data and if each  
11 broadcast channel operates, on the average, to broadcast 30  
12 different programs in a 24 hour period,  $30 \times 80 = 2400$  frames of  
13 reduced size images are stored as the EPG image data (EPG 1) for  
14 each 24 hour period. In the preferred embodiment, however,  
15 switcher 301 supplies to EPG data generator 309 a selected frame  
16 contained in each program supplied to the switcher over the  
17 respective broadcast channels. The EPG generator includes a  
18 Joint Photographic Experts Group (JPEG) encoder 310 which is  
19 supplied with the respective video frames selected by switcher  
20 301 to encode those frames in accordance with the JPEG standard  
21 thereby producing the EPG image data (EPG 1).

22 As will described below, the promotion program data  
23 that is received and displayed on television receiving apparatus  
24 includes icons which represent different categories of programs  
25 (e.g., movie, drama, comedy, sport, etc.), logos adopted by the

1 different broadcast channels and other graphic displays. The  
2 transmission of such icons, logos and graphic displays may occupy  
3 a large amount of the data capacity of the promotion program  
4 data. It is preferable, then, to pre-store at each receiver (as  
5 by conventional sending and storing techniques) the  
6 aforementioned, icons, logos and graphic displays and then  
7 transmit, as part of the promotion program data, access  
8 information which is used at the receiver to read out and display  
9 the pre-stored icons, logos and graphic displays. Such access  
10 data may be, for example, bit-map data; and as illustrated in  
11 Fig. 1, such access data is generated by EPG data generator 309  
12 and supplied to promotion channel generator 302 whereat it is  
13 combined with the program data of the two broadcast channels  
14 selected as promotion channels by switcher 301.

15 Each MPEG encoder 303-1 ... 303-7 compresses the video  
16 and audio data included in the program data supplied thereto by  
17 the respective group of five broadcast channels. The compressed  
18 program data produced by MPEG encoder 303-1 is coupled to a  
19 multiplexer 304-2; the compressed program data produced by MPEG  
20 encoder 303-2 is coupled to a multiplexer 304-3, and so on,  
21 whereby the compressed program data produced by MPEG encoder 303-  
22 7 is coupled to a multiplexer 304-8. It is seen, then, that each  
23 multiplexer 304-2 ... 304-8 is supplied with five broadcast  
24 channels of compressed program data. An additional multiplexer  
25 304-1 is coupled to promotion channel generator 302 to receive



1 the promotion program data derived from the two broadcast  
2 channels selected by switcher 301 as well as the bit-map data  
3 generated by EPG data generator 309, as will be described in  
4 greater detail in connection with Fig. 2.

5 EPG image data (EPG 1) is supplied from EPG data  
6 generator 309 to each of multiplexers 304-1 ... 304-8 and EPG  
7 text data (EPG 2) also is supplied from the EPG data generator to  
8 each of these multiplexers. The EPG image data (EPG 1) is  
9 comprised a single frame of video data, processed to be of  
10 reduced size, and is referred to herein as still picture data;  
11 and the EPG text data (EPG 2) is referred to herein as program  
12 guide text data. The program guide text data (EPG 2) is  
13 associated with, for example, 80 broadcast channels and includes  
14 information, such as channel identification, program title,  
15 broadcast time and date and other descriptive material, relating  
16 to the program which is to be transmitted. This program guide  
17 text data (EPG 2) is associated with programs to be transmitted  
18 over a predetermined time duration, such as programs that  
19 currently are being transmitted as well as programs that will be  
20 transmitted over the next 24 hours. EPG data generator 309 is  
21 operable to generate additional program guide text data (EPG 3)  
22 which is similar to EPG 2 but relates to programs that will be  
23 transmitted for an additional period of time, for example,  
24 programs that will be transmitted for an additional 126 hours.  
25 Figs. 11A and 11B, which will be described below, schematically

1 illustrate the relationship between the program guide text data  
2 EPG 2 and EPG 3. In the preferred embodiment described herein,  
3 program guide text data (EPG 3) is supplied to multiplexer 304-1  
4 for transmission with the promotion program data. As mentioned  
5 above, the promotion program data may be thought of as being  
6 transmitted over the promotion channel and serves the function of  
7 promoting particular programs transmitted on one or more of the  
8 broadcast channels.

9 Each of multiplexers 304-1 ... 304-8 operates to  
10 multiplex the EPG and program data to supplied thereto to produce  
11 a data output channel. The respective data output channel,  
12 comprised of multiplexed EPG1, EPG2 and compressed program data  
13 (the data output channel from multiplexer 304-1 also includes EPG  
14 3) is coupled to a digital modulator 305-1 ... 305-8 which  
15 performs digital modulation on the multiplexed EPG and program  
16 data produced by each of the respective multiplexers. For  
17 example, each digital modulator may perform quadrature phase shift  
18 keying (QPSK), EFM, or other conventional digital modulation.  
19 The resulting digital modulated data output channels produced by  
20 the digital modulators are transmitted to respective transponders  
21 located on a satellite by means of a synthesizer 306 and a  
22 ground-to-satellite antenna 307. In the embodiment shown in Fig.  
23 1, the digital modulators and synthesizer transmit the data  
24 output channels from multiplexers 304-1 .... 304-8 respectively,  
25 to a corresponding one of 8 transponders. The transponders to

1 which the modulated data output channels from multiplexers 304-2  
2 ... 304-8 are supplied are referred to as normal broadcast  
3 transponders 2, 3, .... 8 and the transponder to which the  
4 modulated data output channel from multiplexer 304-1 is supplied  
5 is referred to as the promotion channel transponder, also known  
6 as the "guide" transponder. These transponders are used to  
7 transmit the promotion channels and the broadcast channels to  
8 receiving devices that are furnished with compatible satellite  
9 dish antennas.

10 It is seen, then, that if the EPG data represents  
11 programs broadcasted on 80 broadcast channels, each of the data  
12 output channels from multiplexers 304-1, . . . 304-8 contains the  
13 same EPG data. As mentioned above, in the embodiment described  
14 herein, the data output channel from multiplexer 304-1 contains  
15 additional EPG data namely EPG 3.

16 Promotion channel generator 302 is illustrated in  
17 greater detail in Fig. 2. Two single frame generators 332-1 and  
18 332-2 are coupled to switcher 301 to receive therefrom the video  
19 and audio data transmitted over the two broadcast channels  
20 selected as the promotion channels by the switcher. As an  
21 example, the promotion channels need not necessarily be network  
22 television channels normally used to broadcast network television  
23 programming. Rather, the promotion channels may be separate,  
24 dedicated channels made available to sponsors such as other  
25 commercial television networks for the purpose of broadcasting to

1 consumers information relating to sponsored programs. Each of  
2 the single frame generators processes the video data supplied on  
3 the broadcast channel selected as the promotion channel to  
4 generate single video frames. For example, the same video frame  
5 may be transmitted for a given time interval, such as for a  
6 second, for a minute or for several minutes.

7 The output from single frame generator 332-1 is  
8 referred to as single-frame data and is supplied to a  
9 superimposer 333-1. The audio data associated with the broadcast  
10 channel that has been selected by switcher 301 as the promotion  
11 channel is coupled from single frame generator 332-1 to an  
12 encoder 334-1 which, as illustrated in Fig. 2, is identified as  
13 an MPEG video/audio encoder. In a similar manner, the single-  
14 frame data produced by single frame generator 332-2 is supplied  
15 to a superimposer 333-2; and the audio data contained in the  
16 broadcast channel which has been selected by switcher 301 as the  
17 promotion channel is coupled from single frame generator 332-2 to  
18 an MPEG video/audio encoder 334-2. Superimposers 333-1 and 333-2  
19 also are supplied with the aforementioned access data generated  
20 by EPG data generator 309 and referred to heretofore as bit-map  
21 data. This access data is combined with the single-frame data by  
22 the superimposer; and the combined data is coupled to a  
23 respective one of the MPEG video/audio encoders.

24 Each MPEG video/audio encoder operates to compress the  
25 single-frame video data, the superimposed access data and the

1 audio data supplied thereto. The resultant compressed promotion  
2 channel program data from encoders 334-1 and 334-2 are  
3 multiplexed together by a multiplexer 335 and supplied as  
4 promotion channel program data to multiplexer 304-1 of Fig. 1.

5 A display of the promotion program data processed by  
6 single frame generator 332-1, superimposer 333-1 and MPEG  
7 video/audio encoder 334-1 is illustrated in Fig. 3. It will be  
8 seen that text data produced by EPG data generator 309, as well  
9 as a logo display, are superimposed onto the single frame of  
10 video data produced by single frame generator 332-1. Here, the  
11 text data reads: "promotion channel", "NHK channel 1", "program  
12 presentation". Thus, the text data provides the promotional  
13 information which, in this instance is sponsored by the NHK  
14 television broadcast network of Japan. It will be understood  
15 that the single frame video display is itself an advertisement  
16 which may be paid for by a sponsor.

17 The NHK logo shown in Fig. 3 may, in one embodiment be  
18 generated by EPG data generator 309 (Fig. 1) or may be stored at  
19 the receiving device (to be described) and accessed from storage  
20 by the transmission of suitable access data (such as bit-map  
21 data) generated by the EPG data generator and transmitted over  
22 the promotion broadcast channel.

23 To best appreciate the electronic program guide which  
24 is transmitted, received and displayed in accordance with the  
25 present invention, reference is made to Figs. 4-10 which

1 illustrate the respective displays that are selectively produced  
2 from the EPG data transmitted by the apparatus shown in Fig. 1.  
3 As will be described, it is preferred that the transmitted EPG  
4 data not be displayed automatically. Rather, such EPG data is  
5 stored at the receiver (Fig. 23) and selectively retrieved from  
6 storage by the user's operation of a suitable remote control  
7 device of the type shown in Fig. 24. Hence, when the EPG display  
8 is not selected, the receiving apparatus, and more particularly  
9 the television monitor displays whatever program currently is  
10 being transmitted over the broadcast channel and that has been  
11 selected by the user. When the user wishes to exploit the EPG  
12 data that has been transmitted to and stored at his receiver, he  
13 selects an EPG display mode (as will be described), resulting in  
14 the display of several images of reduced, less than normal size,  
15 superimposed over the program which then is being received over  
16 the broadcast channel to which the receiver is tuned. Fig. 4  
17 illustrates the superposition of, for example, five reduced size  
18 images, also referred to as still picture images or EPG images,  
19 displayed in what is referred to as a program window,  
20 superimposed over the "normal size" display of the program which  
21 then is being received. Each still picture image is reproduced  
22 from image data EPG 1 produced by EPG data generator 309, as  
23 aforescribed. For ease of understanding a category icon is  
24 superimposed on each respective still picture image, thereby  
25 enabling the user to identify quickly the type of program that is

1 identified by that still picture image. These category icons may  
2 be generated by EPG data generator 309 and included as the still  
3 picture data EPG 1 or, alternatively, the category icons may be  
4 stored at the user's receiver and accessed therefrom by suitable  
5 access data, such as bit-map data, included with the still  
6 picture data EPG 1 generated by the EPG data generator.

7 As mentioned above, in the preferred embodiment of the  
8 present invention, the EPG image data EPG 1 represents all of the  
9 programs which currently are being transmitted on the broadcast  
10 channels (for example, all of the programs currently being  
11 transmitted on the 80 broadcast channels) and may also represent  
12 those programs which will be transmitted over a given period of  
13 time (for example, over the next 1, 4 or 24 hours) on the  
14 broadcast channels. Such EPG image data is stored at the  
15 receiver and selectively retrieved and displayed by the user in  
16 response to his operation of the remote control device. Thus,  
17 the user may display and scroll through various still pictures,  
18 thereby discerning those programs which he may wish to view. A  
19 cursor is displayed adjacent or, alternatively, superimposed over  
20 the still pictures, this cursor being positionable at or over a  
21 desired still picture, as selected by the user, for the purpose  
22 of displaying EPG text data associated with the program  
23 identified by that still picture or, in accordance with one  
24 embodiment, to tune the user's receiver to the broadcast channel

1 over which the program identified by that still picture is  
2 transmitted.

3 In addition to the program window superimposed over the  
4 program display, as shown in Fig. 4, the EPG display mode  
5 preferably displays information in a "title bar" that also is  
6 superimposed on the program display. In one embodiment, the  
7 title bar displays text data that is associated with the  
8 displayed program, such as the broadcast channel over which the  
9 program is transmitted, the title of that program and,  
10 optionally, an icon representing the category of that program.  
11 As the user tunes his receiver to a different broadcast channel,  
12 the information displayed in the title bar changes in a similar  
13 manner to display the broadcast channel, title of the program and  
14 category of that program to which the receiver now is tuned. It  
15 will be appreciated that the information displayed in the title  
16 bar is included in the program data supplied to and encoded by  
17 the MPEG encoders 303-1 . . . 303-7 of Fig. 1.

18 Alternatively, the information displayed in the title  
19 bar shown in Fig. 4 may be associated with the program identified  
20 by the still picture that has been selected by the cursor. That  
21 is, depending upon the particular still picture to which the user  
22 places the cursor, the title bar displays the title of the  
23 program identified by that still picture, the broadcast channel  
24 over which that program is transmitted and the category of that  
25 program.



1           Fig. 5 illustrates the title bar shown in Fig. 4 and  
2           Fig. 6 illustrates the program window which contains the EPG  
3           images also shown in Fig. 4.

4           The EPG text data associated with the program  
5           identified by a selected still picture may be selectively  
6           displayed by appropriate user-operation of the remote control  
7           device. As mentioned above, the EPG image data as well as the  
8           EPG text data are stored at the receiver. It is expected the  
9           user will position the cursor on or adjacent a desired still  
10          picture and then operate a suitable selector button on his remote  
11          control device to retrieve and display the EPG text data as shown  
12          in Fig. 7. Preferably, this display constitutes a full screen  
13          display, although the information shown in Fig. 7 may be  
14          displayed in a suitable "window" on the display screen. It is  
15          seen that the display includes the still picture image  
16          represented by EPG image data EPG 1 as well as text data  
17          represented by EPG text data EPG 2. In the example shown in Fig.  
18          7, this EPG text data includes the date and time of broadcast of  
19          the program identified by the still picture, the broadcast  
20          channel over which this program is transmitted, the cast and also  
21          a synopsis of that program. The cast and synopsis may be thought  
22          of as detailed program information referred to as program content  
23          data. The title, date and time of the program to be transmitted  
24          are referred to as brief program information and are included in

1 program table data to be described. Fig. 7 also illustrates the  
2 title bar discussed above in conjunction with Figs. 4 and 5.

3 The EPG text data EPG 2 and EPG 3 normally are stored  
4 at the user's receiver and, depending upon the display mode  
5 selected by the user, such EPG text data may be displayed in the  
6 form of a table to display the programs that will be transmitted  
7 over the broadcast channels for a given time period, such as  
8 shown in Fig. 8, or may be displayed as a program table  
9 representing the programs that will be transmitted over a  
10 particular broadcast channel, such as shown in Fig. 9, or as a  
11 detailed program display associated with a particular program  
12 selected by the user, such as shown in Fig. 10. In each of these  
13 figures, the EPG text data is superimposed over the  
14 aforescribed promotion channel display. Nevertheless, it will  
15 be appreciated that the EPG text data shown in Figs. 8, 9 and 10  
16 may be superimposed over a program then being received by one of  
17 the other broadcast channels, or the display may be a full screen  
18 display with no background images.

19 The program table shown in Fig. 8 displays the titles  
20 of those programs which are transmitted by respective broadcast  
21 channels for particular periods of time. It is expected that the  
22 displayed table will list less than all of the eighty broadcast  
23 channels (which has been used as the illustrative example), and  
24 the user may scroll through additional, similar display screens  
25 to display the television programs to be transmitted over the

1 additional broadcast channels. Likewise, the program table  
2 display of Fig. 8 depicts those programs which are transmitted  
3 over a three hour duration; and since the EPG text data includes  
4 EPG data associated with many more hours of programming, the user  
5 may scroll through additional display screens to display those  
6 programs which will be transmitted at later times.

7 The program table display of Fig. 9 is similar to that  
8 of Fig. 8, except that the Fig. 9 display is limited to those  
9 programs which are transmitted over a particular single broadcast  
10 channel. The table of Fig. 9 may illustrate those programs which  
11 are to be transmitted over, for example, a five hour duration;  
12 and the user may scroll through additional display screens in  
13 order to display the additional programs to be transmitted at  
14 later times over this broadcast channel. Whereas Figs. 8 and 9  
15 depict program tables which display what may be thought of as  
16 brief program information (e.g. time of transmission, program  
17 title and broadcast channel), Fig. 10 illustrates a display of  
18 more detailed information, referred to herein as program content  
19 data. This information is included in the EPG text data EPG 2  
20 (and EPG 3) produced by EPG data generator 309 of Fig. 1; and  
21 preferably is updated periodically, such as every 15 minutes.  
22 This detailed program information includes, for example, a  
23 description or synopsis of a particular program, its cast, its  
24 date of production, and other information that may be of use to  
25 the user. Such information may be retrieved from the EPG text

1 data stored at the receiver by suitable operation of the remote  
2 control device. For example, the cursor may be used to select a  
3 particular still picture that is displayed, and then an  
4 information button on the remote control device may be operated  
5 to read out the display shown in Fig. 10 which is associated with  
6 the program identified by that still picture. Alternatively, a  
7 cursor may be used to select a particular program that is  
8 displayed in the program table of Fig. 8 or the program table of  
9 Fig. 9, thereby retrieving the text data shown in Fig. 10 which  
10 is associated with the selected program.

11 It will be recognized that the EPG text data needed to  
12 display the program table shown in Fig. 8 or Fig. 9, the detailed  
13 program information shown in Fig. 10 and the information screen  
14 shown in Fig. 7 occupies much of the available transmission  
15 capacity of the data output channels produced by multiplexers  
16 304-1 . . . 304-8 of Fig. 1. If each data output channel  
17 includes all of the EPG data needed to transmit the still EPG  
18 images and all of the EPG text data, the remaining data capacity  
19 of these data output channels may not be sufficient for adequate  
20 transmission of the video and audio data. To obviate this  
21 disadvantage, it is preferred to transmit a lesser amount of EPG  
22 data with the "normal" broadcast channels than with the promotion  
23 broadcast channels. That is, and with reference to Fig. 1, it is  
24 preferred to transmit a lesser amount of EPG data on the data  
25 output channels of multiplexers 304-2 . . . 304-8 than on the

1 data output channel from the multiplexer 304-1. This is attained  
2 by supplying EPG data EPG 1 and EPG 2 to multiplexers 304-2 . . .  
3 304-8 and to supply EPG data EPG 1, EPG 2 and EPG 3 to  
4 multiplexers 304-1. The difference between the EPG data  
5 represented by EPG 2 and EPG 3 is schematically represented in  
6 Figs. 11A and 11B.

7 Fig. 11A schematically illustrates the EPG data that is  
8 supplied to and transmitted by the "normal" transponders, namely  
9 those transponders which are used to transmit the normal  
10 broadcast channels received on the data output channels from  
11 multiplexers 304-2 ... 304-8. Fig. 11B schematically represents  
12 the EPG data that is supplied to and transmitted by the  
13 transponder assigned to transmit the promotion broadcast  
14 channels, this transponder being referred to hereinabove as the  
15 "guide" transponder, and received on the data output channel from  
16 multiplexer 304-1. The EPG text data EPG 2 supplied to a normal  
17 transponder includes program table data (referred to as "brief  
18 program information") and program content data (referred to as  
19 "detailed program information"). It is assumed that the program  
20 table and program content data are associated with programs that  
21 are transmitted over, for example, 80 broadcast channels. Since  
22 the amount of data needed to represent the program table for a  
23 given channel is less than the amount of data needed to represent  
24 the program content for that channel, the program table data may  
25 represent program information for the 80 channels which are

1 transmitted over a greater period of time and the program content  
2 data may represent program information for the 80 channels which  
3 are transmitted over and shorter period of time. For example,  
4 the program table data EPG 2 of the type shown in Fig. 8 may  
5 represent the programs transmitted over the 80 broadcast channels  
6 for a twenty-four (24) hour period, whereas the program content  
7 data EPG 2, shown in Fig. 10, may represent the programs  
8 transmitted over these 80 channels for a shorter period of time,  
9 such as four (4) hours. In one embodiment, the EPG image data  
10 EPG 1 represents the programs that will be transmitted over these  
11 80 channels for the next one hour period; and in another  
12 embodiment, the EPG image data represents the programs that will  
13 be transmitted over, for example, a 24 hour period.

14 A greater amount of EPG data is transmitted by the  
15 guide transponder, as depicted in Fig. 11B. Although the guide  
16 transponder may transmit normal programming in addition to  
17 promotion programs, the amount of normal programming transmitted  
18 by the guide transponder is less than that transmitted by the  
19 normal transponder, thus increasing the available data capacity  
20 for transmission of the EPG data. Thus, the guide transponder  
21 may transmit program table data EPG 2 for 80 broadcast channels  
22 over a 24 hour period, and the guide transponder also may  
23 transmit program table data EPG 3 representing the programs  
24 transmitted by those 80 broadcast channels over the succeeding  
25 126 hours. The guide transponder thus may transmit still picture

1 data EPG 1, program table data EPG 2 and program table data EPG 3  
2 representing the programs transmitted over 80 broadcast channels  
3 for a 150 hour period. It is appreciated that this large  
4 quantity of EPG data may be used by the consumer to properly plan  
5 and select programs for viewing over a relatively long term (for  
6 example, over a 5-day period).

7 Fig. 11B also illustrates the program content data (for  
8 example, the data which is displayed in Fig. 10) that may be  
9 transmitted by the guide transponder for 80 broadcast channels.  
10 In the example illustrated, the guide transponder transmits  
11 program content data EPG 2 associated with the programs  
12 transmitted by 80 broadcast channels over the next 4 hours; and  
13 the guide transponder also transmits the program content data EPG  
14 3 associated with the programs transmitted over these broadcast  
15 channels for the next-following 66 hours. It will be seen, then,  
16 that by receiving the EPG data from the normal and guide  
17 transponders, a sufficient quantity of EPG data may be stored at  
18 the receiver to permit the user to display EPG still pictures,  
19 brief program information as well as detailed program information  
20 relating to those programs currently being transmitted and those  
21 programs which will be transmitted over the next few days. It  
22 also will be recognized that the program content data is  
23 associated with those programs that will be transmitted during a  
24 fraction of the time interval that is represented by the program  
25 table data. Whereas the program table data transmitted by the

1 normal transponder is associated with programs that will be  
2 transmitted over a 24 hour period, the program content data  
3 transmitted by the normal transponder is associated with programs  
4 that will be transmitted over only a 4 hour period. Likewise,  
5 whereas the program table data that is transmitted by the guide  
6 transponder relates to programs that will be transmitted over a  
7 150 hour period, the program content data that is transmitted by  
8 the guide transponder is associated with programs that will be  
9 transmitted over a 70 hour period.

10 Fig. 12 schematically represents the EPG data that is  
11 transmitted by the guide transponder, identified as transponder  
12 1, and the normal transponders, identified as transponder 2 . . .  
13 transponder 8. The guide transponder is supplied with and  
14 transmits program table data associated with programs transmitted  
15 over a 150 hour period and with program content data associated  
16 with those same programs, but transmitted over a 70 hour period.  
17 The guide transponder also is supplied with the EPG still image  
18 data and also with the program data of the promotion broadcast  
19 channels, namely the single frame data discussed above in  
20 conjunction with Figs. 1 and 2. Each of the normal transponders  
21 is supplied with program table data associated with programs that  
22 will be transmitted over a 24 hour period and with program  
23 content data associated with those same programs but transmitted  
24 over a 4 hour period. Each normal transponder also is supplied  
25 with the EPG image data and with the program data transmitted



1 over several broadcast channels. In the example discussed in  
2 conjunction with Fig. 1, it has been assumed that each of the  
3 normal transponders operates to transmit 5 broadcast channels;  
4 but in a practical embodiment, it is expected that each normal  
5 transponder is operable to transmit up to 10 or more broadcast  
6 channels. Likewise, in a practical implementation, the guide  
7 transponder need not be limited solely to the transmission of  
8 promotion programs (together with, of course, EPG data), but may  
9 be used to transmit regular broadcast channels as well, such as 2  
10 promotion channels and 8 broadcast channels. It will be  
11 recognized that the present invention should not be limited  
12 solely to the examples described above; and this invention is  
13 readily applicable with any practical number of broadcast and  
14 promotion channels.

15 Although forming no part of the present invention per  
16 se, one construction of the EPG data that may be produced by EPG  
17 data generator 309 now will be described.

18 The EPG data, as well as other types of accessory data,  
19 is transmitted in a Direct Video Broadcast (DVB) System as  
20 service information (SI). The data used to produce and display  
21 an electronic program table is shown in Fig. 13. A Service  
22 Description Table (SDT) includes service provider data which  
23 identifies the provider of the transmission service (e.g. the  
24 broadcast channel), the service name and the service type. For  
25 example, the service type may indicate whether the type of

1 service is single frame service (promotion\_service). The title  
2 of a program to be transmitted is defined as the event\_name in  
3 the Short Event Descriptor of an Event Information Table (EIT)  
4 and may include up to 60 bytes. The subtitle (type) is  
5 represented as the Component Descriptor of the EIT. The current  
6 date and time is defined as UTC\_time in the Time and Date Table  
7 (TDT), whereas the program start time is represented as  
8 start\_time of the EIT and the program duration is established by  
9 the end\_time of the EIT. A rating code representative of, for  
10 example, violence, profanity and nudity of the program, is  
11 included in the Parental Rating Descriptor of the EIT. The video  
12 mode is represented as a Component Descriptor of the EIT. The  
13 provide language (e.g. the language in which the program is  
14 provided) is represented in the ISO639 Language Descriptor of a  
15 Program Map Table (PMT). The sound mode is represented in the  
16 Component Descriptor of the EIT. The category of the program is  
17 set out in the Content Descriptor of the EIT.

18 The brief explanation of the program, such as the cast  
19 (see Fig. 7), the overall program data (see the program table of  
20 Fig. 8) and the channel program table (see Fig. 9) are  
21 represented as the 64-byte data referred to as the Short Event  
22 Descriptor of the EIT. The detailed program explanation, such as  
23 the synopsis (or content explanation) shown in Fig. 7 and the  
24 detailed program explanation shown in Fig. 10 are represented as  
25 the 256-byte data referred to as the Extended Event Descriptor of

1 the EIT. Promotion information, such as the information shown in  
2 Fig. 3, including the item name ("Promotion Channel 1, NHK"), the  
3 item content ("Program Introduction"), and the station logo, are  
4 represented as the Promotion Descriptor of the SDT.

5 Fig. 14 illustrates the data structure of the SDT  
6 (Service Descriptor Table). The SDT includes data representing  
7 the services included in the system, such as the service name,  
8 the service provider, etc. The number in parentheses in Fig. 14  
9 represents the number of bytes used to represent the information  
10 identified thereby. The leading 10 bytes are used as a header  
11 that is formed of common structure 1(3), transport stream  
12 identification (transport\_stream\_id (2)), common structure 2(3),  
13 and original network identification (original\_network\_id(2)).  
14 The transport stream ID may be thought of as a label for  
15 distinguishing the transport stream from the SDT from other  
16 transport streams multiplexed in the same delivery system. The  
17 original network ID may be thought of as a label for identifying  
18 the network which serves as the source of the delivery system.

19 Following the header are service descriptors loop [0]  
20 to service descriptors loop [N] and, finally, error-correcting  
21 code CRC\_32(4). Each service descriptors loop includes  
22 service\_id(2), six reserved bits, EIT\_schedule\_flag,  
23 EIT\_present/following\_flag, running\_status, and free\_CA\_mode.  
24 The service\_id serves as a label for distinguishing the service  
25 in this descriptor from the other services in the same transport

1 stream. The service\_id performs the same function as the program  
2 number (program\_number) in the corresponding program map table  
3 (PMT) (program\_map\_section) of Fig. 18. The EIT\_schedule\_flag  
4 indicates the presence or the absence of the EIT\_schedule  
5 information in the EIT transport stream. The  
6 EIT\_present/following\_flag represents the presence or the absence  
7 of the EIT\_present/following information in the EIT transport  
8 stream. The running status designates the status of the service  
9 (or program), such as whether the service (or broadcast channel)  
10 has or has not yet started, is beginning to start in a few  
11 minutes (this is useful for setting up a VCR for recording), has  
12 already started, or is currently suspended. The free\_CA\_mode  
13 indicates whether the service or broadcast channel can be  
14 accessed free of charge or is controlled by a conditional access  
15 system (such as pay per view, premium subscriber, etc.).

16 Following the free\_CA\_mode bit is the  
17 descriptor\_loop\_length to identify the overall byte length of  
18 subsequent descriptors. The adjacent service\_descriptor[i]  
19 supplies the name of the service\_provider and the name of the  
20 service in text format, as well as the service\_type. The next  
21 following country\_availability\_descriptor[i] represents a list of  
22 the counties that can access the service and a list of the  
23 countries that cannot. The subsequent descriptors include the  
24 promotion description.

Fig. 15 illustrates the data structure of the Event Information Table (EIT). The leading 10 bytes are used for the header that is formed of the common structure 1(3), service\_id(2), the common structure 2(3), and the transport stream identification transport\_stream\_id(2). Following the header is the original\_network\_id(2) and a last\_table\_id(1). The last\_table\_id(1) identifies the final (or maximum) table\_id. If only a single table is used, the table\_id is set. If table\_id assumes consecutive values, this information is stored in chronological order. There follow event descriptors loop[0] to event descriptors loop[N] and finally, CRC\_32(4).

Each event descriptors loop includes event\_id(2) to provide the identification number of the event (or program) that is described, and start\_time (5) for displaying the start time of the event in Universal Time Coordinates (UTC) and Modified Julian Day Coordinates (MJD). In this start time field, 16 least significant bits (LSB) of the MJD-displayed data are provided, and six digits represented by four-bit binary-coded decimal (BCD) symbols, or 24 bits. For example, 93/10/12 12:45:00 can be coded as OXC078124500. Following the start time data is the duration (3) which represents the duration of the event (program) in hours, minutes and seconds. Thereafter are the running\_status, free\_CA\_mode, and descriptor\_loop\_length (1.5). Then, Short\_event\_descriptor[i](7+α) is provided to identify the event name and provide a short description of the event such as in the

1 form of the program table. Then follows  
2 Extended\_event\_descriptor[i](11+α) to provide a more detailed  
3 description of the event (such as in the format of the program  
4 content shown in Fig. 10) than the description provided by the  
5 Short event descriptor.

6           Thereafter are audio\_component\_descriptor[i](6),  
7 video\_component\_descriptor[i](3), and  
8 subtitle\_component\_descriptor[i](6). The subsequent CA-  
9 identifier\_descriptor[i](4) indicates whether the event is  
10 scrambled, whether reception is restricted, such as whether a  
11 charge is required for reception, and so on. Finally, other  
12 descriptors, such as event\_still\_image\_descriptor[i] representing  
13 the data of the program window (still-picture data) shown in Fig.  
14 6, are provided.

15           Fig. 16 illustrates the structure of the  
16 event\_still\_image\_descriptor[i] (still-picture format). As shown  
17 in Fig. 16, an 8-bit descriptor-tag is disposed as leading data  
18 to represent that the information which follows is still-picture  
19 data. Then, 8-bit descriptor-length indicates the overall format  
20 length; and 8-bit descriptor-number and 8-bit last-descriptor-  
21 number designate the number of the descriptor and the last  
22 (maximum) descriptor, respectively. Finally, image\_structure  
23 representing substantial image data of the still picture is  
24 positioned. This image\_structure is formed of an 8-bit  
25 format\_identifier, a 32-bit image\_size indicator and the

1 image\_data itself. The format\_identifier represents the ID of  
2 the image\_data. When the format\_identifier is 0x10, the  
3 image\_data is identified as black-and-white binary image data.  
4 If the format\_identifier is 0x11, the image\_data is identified as  
5 black-and-white 256-step image data. If the format\_identifier is  
6 0x12, the image\_data is identified as RGB image data, with each  
7 color being formed of 8 bits. When the format\_identifier is  
8 0x20, the image\_data is identified as having been compressed by  
9 the JPEG technique. In the embodiment shown in Fig. 1, the  
10 reduced-size still image frame forming the program window is  
11 compressed by the JPEG technique, and the format\_identifier is  
12 0x20. When the image\_data is binary black-and-white image data,  
13 the number of bits included therein may not be an integral  
14 multiple of 8 bits, in which case, "dummy data" is stuffed into  
15 the image\_data field to "fill in" this field.

16 Fig. 17 illustrates the structure of the Time Data  
17 Table (TDT). The TDT is formed of the common structure 1(3) and  
18 the UTC\_time(5). In addition to the above-described tables, the  
19 Service Information (SI) includes the Program Map Table (PMT)  
20 shown in Fig. 18 and the Program Association Table (PAT)  
21 illustrated in Fig. 19.

22 The PMT includes, as shown in Fig. 18, the common  
23 structure 1(3), the transport\_stream\_id(2), the common structure  
24 2(3), and program\_map\_id\_loop[0](4) to program\_map\_id\_loop[N](4).  
25 Finally CRC\_32(4) is provided. Each program\_map\_id\_loop[i](4) is

1   formed of program\_number[i](2) and program\_map\_PID[i](2) (or  
2   network PID) wherein PID represents packet id. The  
3   program\_number represents the program used to implement the  
4   corresponding program\_map\_PID. For example, when the program  
5   number is set to 0x0000, the PID in the next-following  
6   program\_map\_PID acts as network\_PID. The values of the  
7   program\_number other than 0x0000 are defined by the user. In  
8   this program\_number field, the same value cannot be taken in the  
9   Program Association Table (PAT). For example, if the  
10   program\_number is used for specifying the broadcast channel, the  
11   network\_PID defines the PID of a transport stream packet  
12   including the Network Information Table (NIT). Although the  
13   value of the network\_PID (as well as the value of the  
14   program\_map\_PID) can be defined by the user, the user cannot  
15   assign a value reserved for another use. The presence of the  
16   network\_PID is optional. The program\_map\_PID specifies the PID  
17   of a transport stream packet containing the effective PMT for the  
18   program defined by the program\_number. Two or more  
19   program\_map\_PIDs cannot be allocated to the program\_number.

20           In the PAT illustrated in Fig. 19, the 10-byte header  
21   is formed of the common structure 1(3), a program\_number(2), the  
22   common structure 2(3), and PCR\_PID(1.375). The PCR\_PID indicates  
23   the PID of the transport stream packet that includes the program  
24   clock reference (PCR) field effective for the program defined by  
25   the program-number. If there is no PCR related to the defined



1 program with respect to a private stream, this field assumes the  
2 value of 0x1FFF. There follows program\_info\_length(1.5) to  
3 specify the byte number of the following descriptor, and then the  
4 program info descriptors, including CA\_descriptor,  
5 Copyright\_descriptor, Max\_bitrate\_descriptor, etc. Thereafter  
6 are stream type loop[0](5+ $\alpha$ ) to stream type loop[N](5+ $\alpha$ ), and  
7 CRC\_32(4). Each stream type loop includes stream\_type(1) and  
8 elementary\_PID(2). The stream\_type defines the type of payload  
9 or indicates that the elementary stream transmitted in a packet  
10 has the PID specified by the elementary\_PID. The value of the  
11 stream\_type is defined by the MPEG2 technique. The  
12 elementary\_stream\_PID specifies the PID of the related elementary  
13 stream and the PID of the transport stream packet which transmits  
14 this data. Following the elementary\_PID are 12-bit  
15 ES\_info\_length (1.5): the first two bits of which are 00, and  
16 after these bits the byte number of the descriptor of the  
17 following related elementary stream. Then follows ES info  
18 descriptors[N] which include CA\_descriptors and other  
19 descriptors.

20 One representation of receiving apparatus which  
21 incorporates the present convention is illustrated in Fig. 20.  
22 Here, the receiving apparatus is referred to generically as  
23 audio/video equipment 1 which comprises a receiver/decoder 2  
24 coupled to a suitable antenna 3 for receiving and decoding the  
25 multiplexed program and EPG data transmitted by the apparatus

1 shown in Fig. 1 and for supplying the decoded program and EPG  
2 data to a monitor 4 for display. Antenna 3 may comprise a DSS  
3 dish receiver, a communications satellite antenna or other  
4 suitable antenna equipment adapted to receive the program and EPG  
5 data. Receiver/decoder 2 is described in greater detail below  
6 and is responsive to infra-red (IR) signals transmitted thereto  
7 from a suitable IR module 51 included in a remote control device  
8 5. The functions commanded by the remote control device are  
9 described in greater detail below; and Fig. 24 is a clear  
10 representation of one embodiment of the remote control device.  
11 It will be appreciated that remote control device 5 is operable  
12 to select broadcast channels, adjust the audio volume and utilize  
13 the EPG data, as discussed above.

14 Receiver/decoder 2 is coupled to a monitor 4 by  
15 suitable connecting leads 11 and 12. In the preferred  
16 embodiment, connecting lead 11 supplies video and audio  
17 information to the monitor and connecting lead 12 supplies  
18 control signals thereto. For example, connecting lead 11 may  
19 include two or three separate lines, one for RF video, one for  
20 left-channel audio, and one for right-channel audio signals.  
21 Connecting lead 12 may supply suitable commands to the monitor  
22 such as audio volume control, picture characteristic control,  
23 power on/off control, and the like. It will be understood that  
24 monitor 4 may comprise a conventional television receiver  
25 connected to the receiver/decoder in much the same way as

1 conventional television receivers are connected to cable set-top  
2 boxes. Alternatively, monitor 4 may comprise a multimedia  
3 monitor known to those of ordinary skill in the art.

4 Fig. 21 is a schematic representation of the electrical  
5 connections between receiver/decoder 2, antenna 3 and monitor 4.  
6 For completeness, Fig. 21 also depicts remote control device 5.  
7 Antenna 3 is coupled to receiver/decoder 2 by a low noise block  
8 (LNB) downconverter 3a which, as is known, converts a satellite-  
9 transmitted signal to a signal of suitable frequency compatible  
10 with consumer video devices, such as receiver/decoder 2. The  
11 receiver/decoder supplies to monitor 4 audio and video signals  
12 via connection 11, as mentioned above and as will be described  
13 below in conjunction with Fig. 23.

14 Control signals also are transmitted between the  
15 receiver/decoder and the monitor, such as between control  
16 sections 2A and 4A, provided on these respective devices.

17 Fig. 22 illustrates one embodiment of receiver/decoder  
18 2, which includes a power on/off button 111 disposed on a front  
19 panel 40 thereof. A suitable power indicator 112, such as an  
20 LED, displays whether power is supplied to the receiver/decoder.  
21 Additional LEDs 113 and 114 also are provided, to indicate  
22 whether the receiver/decoder is operable to receive broadcast  
23 channels transmitted via satellite, such as by DSS transmission,  
24 or via conventional over-the-air (or cable) transmission. A

1 TV/DSS changeover button 123 selects the TV or DSS mode of  
2 operation.

3 Satellite communication provides substantial  
4 flexibility and the ability for a service provider to transmit  
5 individual messages to the consumer. For example, a message  
6 relating to subscription charges, bill payment, and the like, may  
7 be transmitted, and an indication of receipt of such a message is  
8 provided by a message LED 114. This LED is reset when the  
9 consumer retrieves and displays the message on, for example,  
10 monitor 4.

11 Receiver/decoder 2 is provided with a menu switch 121  
12 which, when operated, displays a menu on the display screen of  
13 monitor 4. This display is cleared in response to the operation  
14 by the user of an exit button 122.

15 Cursor positioning buttons 117-120 are user-operated to  
16 move a cursor display, such as shown in Fig. 4, on the display  
17 screen. The cursor thus may be moved to a desired EPG still  
18 image or to a particular location on the displayed program table  
19 (Fig. 8). A select button 116 may be operated by the user to  
20 select a particular program identified by the position of the  
21 cursor. In a preferred application of this invention, the  
22 operation of select button 116 sets the receiver/decoder to the  
23 particular broadcast channel at the particular time identified by  
24 the EPG data that has been selected by the cursor. For example,  
25 and as described above, receiver/decoder 2 is tuned to the

1 broadcast channel which carries the program identified by the EPG  
2 still image at which the cursor is positioned.

3 A block diagram of one embodiment of receiver/decoder 2  
4 which incorporates the present invention is illustrated in Fig.  
5 23. The receiver/decoder is provided with a front end 20, a CPU  
6 29, a demultiplexer 24, a data buffer memory 35 and MPEG decoders  
7 25 and 26. Front end 20 is coupled to antenna 3 by way of LNB  
8 downconverter 3a to receive the several broadcast and promotion  
9 channels that are received by the antenna. The front end  
10 includes a tuner 21 operable to be tuned to a particular  
11 broadcast or promotion channel in order to receive the data  
12 transmitted over that channel. The output of tuner 21 is coupled  
13 to a quadrature phase shift key (QPSK) demodulator 22 which recovers  
14 the program and EPG data transmitted over the broadcast channel  
15 to which tuner 21 is tuned. The demodulated digital data then is  
16 subjected to error correction by error correcting circuit 23,  
17 whereupon the recovered program and EPG data are supplied to  
18 demultiplexer 24.

19 CPU 29 is coupled to tuner 21, QPSK demodulator 22,  
20 error correcting circuit 23 and demultiplexer 24 to control the  
21 individual operations of such circuits. For example, the CPU  
22 controls the tuning operation of tuner 21 in a manner  
23 conventionally used to control video and audio tuners. The CPU  
24 also is coupled to control section 2A to control the various  
25 control signals transmitted from receiver/decoder 2 to monitor 4

1 and, likewise, to detect, decode and interpret control signals  
2 that are returned to the receiver/decoder from the monitor.  
3 Front panel 40 is coupled to the CPU, whereby the CPU detects  
4 when power on/off button 111 is operated. Also, an IR receiving  
5 section 39 is coupled to CPU 29 to supply to the CPU various  
6 commands that are generated by remote control device 5 and  
7 supplied as IR signals to the receiver/decoder.

8 As mentioned above, one or more of the broadcast  
9 channels may carry pay-per-view programs, special programs  
10 referred to as "premium" programs and other programs requiring  
11 preestablished subscription, clearance or acceptance. The  
12 program data transmitted over such broadcast channels is  
13 scrambled and encrypted, thereby providing security against the  
14 unauthorized decoding and display of such programs.  
15 Demultiplexer 24 preferably includes decrypting circuitry  
16 requiring the presence of a decrypting key and decrypting  
17 software in order to decode such encrypted programs. An  
18 interface 32 is coupled to demultiplexer 24 and includes suitable  
19 circuitry which, for example, may be mounted on an IC card having  
20 a CPU, ROM, RAM and other conventional digital circuits typically  
21 used to decipher encrypted digital data. A conditional access  
22 module (CAM) 33 may include some or all of the aforementioned  
23 digital circuits, thereby providing the demultiplexer with the  
24 deciphering key needed to decrypt the received programs. CAM 33  
25 also stores payment information and other data relevant to the

1 user's account with the service provider to prevent unauthorized  
2 access to and use of the decrypting software and deciphering key.

3 Demultiplexer 24 supplies to data buffer memory 35 the  
4 decrypted program and EPG data received from front end 20. The  
5 buffer memory may be comprised of a DRAM and may include an EPG  
6 area 35A in which the EPG data is especially stored. As will be  
7 described below, the EPG area stores EPG image and text data  
8 which are selectively retrieved and displayed as, for example,  
9 the still image data shown in Fig. 4, the still image and text  
10 data shown in Fig. 7, the program tables shown in Figs. 8 and 9  
11 or the detailed program information shown in Fig. 10.

12 Although buffer memory 35 is shown as a DRAM, it will  
13 be appreciated that the program and EPG data may be stored in a  
14 static random access memory (SRAM), if desired. The buffer  
15 memory also stores the audio data that is recovered from the  
16 broadcast channel by front end 20.

17 Demultiplexer 24 is controlled by CPU 29 to read from  
18 buffer memory 35 the video and audio program data that had been  
19 received by front end 20 and separated by the demultiplexer. It  
20 is recalled that the video and audio data which are received by  
21 receiver/decoder 2 are in compressed form; and demultiplexer 24  
22 reads the compressed video data from the buffer memory and  
23 supplies same to MPEG video decoder 25. Similarly, the  
24 demultiplexer reads the stored compressed audio data from buffer  
25 memory 35 and supplies same to MPEG audio decoder 26. The MPEG

1 video decoder cooperates with a memory DRAM 25a and the MPEG  
2 audio decoder cooperates with a memory DRAM 26a to store the  
3 compressed video and audio data, respectively, and to perform a  
4 decoding/decompression operation thereon. MPEG decoding  
5 techniques are known to those of ordinary skill in the art and  
6 form no part of the present invention per se. Hence, further  
7 description of such MPEG decoding of the video and audio data is  
8 not provided herein.

9 MPEG decoder 25 supplies the decoded video signals to,  
10 for example, an NTSC encoder 27 whereat the video information is  
11 encoded into luminance and chroma signals Y and C and into a  
12 composite video signal. The luminance and chroma signal Y and C  
13 are supplied to respective outputs by buffer amplifiers 28Y and  
14 28C, respectively, these outputs constituting what is known  
15 conventionally as the so-called S video output. The composite  
16 video signals are supplied to a composite video output by a  
17 buffer 28V. In addition, the composite video signal is coupled  
18 to an RF modulator 41 which supplies an RF video output that is  
19 compatible with conventional receivers.

20 Similarly, MPEG audio decoder 26 recovers digital audio  
21 data from the audio program data supplied thereto; and this audio  
22 data is converted to analog form by a D/A converter 30. The D/A  
23 converter produces left-channel and right-channel stereophonic  
24 audio signals which are coupled to left and right outputs by way  
25 of buffer amplifiers 31L and 31R, respectively. A monaural audio



1 signal also is supplied from D/A converter 30 to RF modulator 41,  
2 whereat the audio signal is combined with the composite video  
3 signal supplied from NTSC encoder 27, thereby forming a composite  
4 television signal at the RF output of the RF modulator. This  
5 composite television signal output is produced by the RF  
6 modulator when TV/DSS selector button 123 is operated to select  
7 the DSS mode. When, however, the TV mode is selected, RF  
8 modulator 41 essentially bypasses whatever outputs may be  
9 supplied thereto by the NTSC encoder and the D/A converter 30 so  
10 as to shunt to the RF output whatever signals may be supplied to  
11 the RF input thereof. Thus, receiver/decoder 2 may be used to  
12 couple to monitor 4 signals that may be coupled to the  
13 receiver/decoder from a VCR, a personal computer or other  
14 audio/video device. Hence, the receiver/decoder may be used to  
15 receive several different types of signals connected thereto via  
16 separate input ports and to select one of those signals to be  
17 supplied to monitor 4 via the RF output.

18 Fig. 23 illustrates various memory devices 36, 37 and  
19 38 which, typically, are used with CPU 29 to control the  
20 operations of the CPU and to permit the CPU to carry out various  
21 processing functions. For example, ROM 37 stores the operating  
22 program for the CPU which permits the processor to execute the  
23 tuning control function, QPSK demodulation function, error  
24 correction function and data detection, separation and decoding  
25 functions. EEPROM 38 stores data relating to the operation of

1 the receiver/decoder that otherwise would be erased when the  
2 power is turned off. For example, the EEPROM stores the identity  
3 of the last broadcast channel to which tuner 21 had been tuned  
4 prior to power turn-off, the identities of those broadcast  
5 channels to which the tuner had been tuned the most during, for  
6 example, the last four weeks (e.g. an indication of the user's  
7 "favorite" channels), the tuning history of tuner 21, and the  
8 like. As a result of this stored data, when power is turned on,  
9 CPU 29 controls tuner 21 to tune either to the last broadcast  
10 channel that had been received prior to power turn-off or to the  
11 broadcast channel which is determined to be the user's favorite  
12 channel. The program stored in ROM 37 preferably determines  
13 which of these alternatives is selected. The EEPROM and the ROM  
14 also are used to control CPU 29 to maintain an appropriate timing  
15 function, even when power is turned off. For example, this  
16 enables the CPU to maintain the current time in hours, minutes,  
17 seconds and also to control timed functions, such as to supply to  
18 a VCR connected thereto via control line 12 a Start Signal when a  
19 particular time is reached, thereby initiating a timed (or  
20 programmed) recording operation. SRAM 36 is used as a working  
21 memory for CPU 29 to assist in the aforementioned and other  
22 processing operations.

23 It is recalled that, to reduce the amount of EPG data  
24 that must be transmitted in order to effect the displays shown  
25 in, for example, Figs. 4-10, the total amount of data needed to

1 display the various icons and logos preferably are not  
2 transmitted as part of the EPG data. Rather, such graphic  
3 display data is pre-stored in a suitable area of DRAM 25a and  
4 access data, such as bit-map data, is transmitted as part of the  
5 EPG data and used to access such pre-stored display data. CPU 29  
6 is coupled to MPEG video decoder 25 to control the MPEG video  
7 decoder to retrieve such display data from DRAM 25a when the CPU  
8 senses the receipt by the multiplexer 24 of such access data.  
9 The stored display data then is read from the DRAM, decoded (i.e.  
10 MPEG-expanded) by decoder 25 and supplied to NTSC encoder 27 for  
11 superposition on the video display, thereby resulting in the  
12 display of such icons and logos in the manner depicted in Figs.  
13 4-10. As will be described below in conjunction with Fig. 28,  
14 the EPG data stored in, for example, EPG area 35A of buffer 35 is  
15 read from the EPG area, temporarily stored in a dedicated area of  
16 DRAM 25a, referred to as an On Screen Display (OSD) area and  
17 retrieved from the OSD area by MPEG decoder 25 to form the EPG  
18 display shown in Figs. 4-10.

19 Fig. 23 also illustrates a modem 34 for interconnecting  
20 CPU 29 to, for example, a telephone line. The modem is used to  
21 exchange billing information, deciphering keys, decrypting  
22 software, and the like between receiver/decoder 2 and the service  
23 provider.

24 Referring to Fig. 24, there is illustrated one  
25 embodiment of remote control unit 5 that advantageously is used

1 with the present invention. As shown, the remote control unit is  
2 provided with various operator-actuated selector switches which,  
3 preferably, are configured as pushbuttons and are referred to  
4 herein simply as "buttons". Fig. 24 also illustrates the IR  
5 transmitter 51 which transmits to receiver/decoder 2 various  
6 commands generated by the operation of one or more of the  
7 illustrated buttons via infra-red transmission.

8 The buttons which are used primarily in conjunction  
9 with displaying the EPG data that is transmitted to and stored in  
10 receiver/decoder 2 are provided in the generally central portion  
11 of the remote control unit. Cursor control buttons 135, 136, 137  
12 and 138 are operated to move the cursor across the display screen  
13 in the directions represented by the arrows shown on these  
14 buttons. For example, the cursor may be positioned at or  
15 adjacent a desired still picture shown in Fig. 4 or at a desired  
16 program table entry shown in Figs. 8 or 9, whereupon the  
17 operation of button 131 selects the program identified by that  
18 still picture. The operation of button 145 retrieves from buffer  
19 memory 35 the EPG data illustrated in Fig. 7, which then is  
20 displayed. Alternatively, the operation of button 158 causes CPU  
21 29 to control tuner 21 to tune to the broadcast channel on which  
22 the program identified by the selected still picture is  
23 transmitted.

24 The operation of button 134 causes CPU 29 to control  
25 MPEG decoder 25 to read from DRAM 25a menu display information

1 that is stored in the OSD area of the DRAM. This menu  
2 information may be of the conventional type normally used with  
3 television receivers, VCR's and the like, and also may permit the  
4 user to select different types of EPG displays, such as the still  
5 picture display shown in Fig. 4, the program table display shown  
6 in Fig. 8 or Fig. 9 or the program content display shown in Fig.  
7 10. Button 134 may be used in conjunction with button 144 to  
8 enable a particular type of EPG display to be selected.

9 A numerical keypad 138 is operated to select a  
10 broadcast channel in the usual manner. A promotion channel may  
11 be selected for display simply by operating button 157. It is  
12 appreciated that when button 157 is operated, tuner 21 is tuned  
13 to the broadcast frequency of the promotion channel. Preferably,  
14 if plural promotion channels can be received, successive  
15 actuations of button 157 advance the tuner from one promotion  
16 channel to the next.

17 Channel up/down buttons 133 and volume up/down buttons  
18 132 permit the user to scroll through successive broadcast  
19 channels and to increase and decrease the audio volume, as  
20 desired.

21 A power on/off button 153 controls power to the  
22 receiver/decoder. Similarly, a television power on/off switch  
23 152 is used to control power supplied to monitor 4. The  
24 actuation of a mute switch 151 mutes the audio output of the  
25 monitor; and the actuation of switch 154 toggles the

1 receiver/decoder between its satellite antenna input and  
2 conventional television input. It will be appreciated that  
3 switch 154 serves substantially the same function as switch 123  
4 shown in Fig. 22.

5 An alternative arrangement to the cursor control and  
6 EPG selection buttons is shown in Fig. 25. Here, button 131  
7 simply is positioned adjacent the cursor-control buttons, rather  
8 than being surrounded by those buttons as shown in Fig. 24.

9 Fig. 26 schematically illustrates the internal  
10 electrical connections between microcomputer 71 contained within  
11 the remote control device, button matrix 82 and IR transmitter  
12 51. The microcomputer includes a CPU 72, a ROM 73 and a RAM 74,  
13 as is conventional. Button matrix 82 represents all of the  
14 pushbuttons shown in Fig. 24, and this button matrix is polled by  
15 the microcomputer to detect and determine which button is  
16 actuated. The command selected via that button is generated by  
17 the microcomputer and supplied to an LED driver 75 which drives  
18 an LED 76 included in IR transmitter 51. Thus, LED 76 transmits  
19 IR signals representing the command generated by microcomputer 71  
20 in response to the actuation of a particular button included in  
21 button matrix 82.

22 Fig. 27 schematically illustrates the manner in which  
23 EPG data is combined with program data, transmitted by the guide  
24 and the normal transponders, and received by receiver/decoder 2.  
25 Program data is comprised of video data and audio data; and EPG

1 data is included in service information (SI) data, the latter  
2 containing the EPG data as well as other data typically  
3 transmitted by the service provider. A packet is formed of the  
4 program and SI data; and successive packets are transmitted to a  
5 respective transponder (four transponders are illustrated in Fig.  
6 27) at suitable frequencies, such as in the frequency range 12.25  
7 GHz to 12.75 GHz. As an example, if the program data of one  
8 broadcast channel is structured as a packet, a normal transponder  
9 may be supplied with ten packets of program data representing the  
10 program information transmitted over 10 respective broadcast  
11 channels. The SI data is multiplexed with these packets, such as  
12 described above in conjunction with Fig. 1. Depending upon the  
13 number of transponders that are provided in a satellite, 10 times  
14 that number of broadcast channels are, of course, transmitted.

15 The packets of program and SI data transmitted by the  
16 various transponders are received by receiver/decoder 2; and as  
17 shown in Fig. 27, the program and SI information are separated  
18 from the respective packets. Front end 20 (discussed in  
19 conjunction with Fig. 23) may be tuned to the transmission  
20 frequency of a particular transponder, whereupon the packets of  
21 program and SI data received from that transponder are  
22 demodulated. The multiplexer 24 separates the program and SI  
23 data from the received packets and temporarily stores the  
24 separated data in data buffer 35. As is typical, each SI packet  
25 includes a header; and although this header is used for various

1 detection and synchronizing purposes, it is not needed for the  
2 actual display of the EPG data. Hence, the EPG data included in  
3 the separated SI packet is stored in EPG area 35A of data buffer  
4 35, as depicted in Fig. 27. The video packet, after being  
5 separated, is stored in DRAM 25a and the audio packet, after  
6 separation, is stored in DRAM 26a. MPEG decoder 25 thus decodes  
7 the video data stored in DRAM 25a and, similarly, MPEG decoder 26  
8 then decodes the audio data stored in DRAM 26a.

9 As a numerical example, the transmission rate of each  
10 transponder channel is on the order of 30 Mbits/second.  
11 Consistent with MPEG encoding, video images exhibiting rapid  
12 motion are represented by MPEG data having a large number of  
13 packets. On the other hand, video images having relatively  
14 little motion, such as a news program, a talk show, or the like,  
15 may be represented by MPEG data having a smaller number of  
16 packets. A transponder thus transmits a smaller number of  
17 programs exhibiting rapid motion and a larger number of programs  
18 exhibiting relatively little motion. In this manner, the average  
19 number of packets transmitted by each transponder is about the  
20 same.

21 The manner in which EPG data is stored and retrieved at  
22 receiver/decoder 2 now will be explained in conjunction with Fig.  
23 28. Depending upon the packet header data, CPU 29 controls  
24 demultiplexer 24 to direct the incoming data to the appropriate  
25 memory destination. For example, EPG data is directed to buffer



1 memory 35, MPEG video data is directed to DRAM 25a and MPEG audio  
2 data is directed to DRAM 26a. The demultiplexer includes  
3 registers 24a which store the appropriate memory addresses into  
4 which the received EPG, video and audio data are directed. Of  
5 course, as mentioned above, all of the received data initially is  
6 stored temporarily in buffer memory 35, whereafter the data is  
7 distributed to the appropriate memory and to the proper addresses  
8 in that memory, namely to the EPG area 35a, to DRAM 25a and to  
9 DRAM 26a.

10 Fig. 28 illustrates an enlarged version of EPG area  
11 35a. It is seen that the EPG data received from a normal  
12 transponder contains, for each of, for example, 80 broadcast  
13 channels, still image data (EPG 1), and text data (EPG 2). As  
14 mentioned above, the text data contains program table data  
15 associated with 24 hours of programs transmitted over those 80  
16 channels. The EPG text data also contains program content data  
17 associated with, for example, four hours of programs transmitted  
18 over those 80 channels. The EPG image data (EPG 1) and the EPG  
19 text data (EPG 2) are stored in the EPG area.

20 When EPG data is received from the guide transponder it  
21 is recalled that a larger amount of EPG data is present. In  
22 particular, the guide transponder transmits EPG text data (EPG 2  
23 + EPG 3) representing program table information associated with  
24 150 hours of programs transmitted over 80 channels. The text  
25 data (EPG 2 + EPG 3) also contains program content information

1 associated with 70 hours of programs transmitted over those 80  
2 channels. Fig. 28 schematically illustrates the storage in EPG  
3 area 35a of the EPG text data (EPG2 + EPG 3) transmitted by the  
4 guide transponder.

5 When the remote control device is operated to display  
6 the EPG data stored in EPG area 35a, the data stored in a  
7 discrete portion thereof, such as in a display area 250, is  
8 retrieved and written into OSD area 25aA of DRAM 25a. For  
9 example, when the user actuates button 144 of remote control  
10 device 5, the EPG image data identifying those programs which are  
11 currently being transmitted by, for example, all 80 of the  
12 broadcast channels are stored in the display area 250 and are  
13 read therefrom and written into the OSD area. Alternatively, if  
14 the user operates the remote control device for the purpose of  
15 displaying a table of EPG information, such as the table shown in  
16 Fig. 8, the EPG text data containing program table information  
17 for those programs transmitted over, for example, a four hour  
18 period are read from display area 250 and written into OSD area  
19 25aA. MPEG video decoder 25 reads and decodes the data stored in  
20 OSD area 25aA and, as shown in Fig. 23, supplies the decoded EPG  
21 data to NTSC encoder 27 whereat the EPG data is superimposed on  
22 program video data and displayed on monitor 4, such as shown in  
23 Fig. 4 (if EPG image data had been written into the OSD area) or  
24 as shown in Fig. 8 (if EPG program table data had been written  
25 into the OSD area).

1           As depicted in Fig. 28, ROM 37, which contains the  
2     operating programs for CPU 29, includes a compressed code  
3     conversion dictionary which is used to expand compressed  
4     character data (i.e. the text data received by receiver/decoder  
5     2) to a form suitable for display. The ROM also includes an  
6     address conversion table which is used by the CPU to read the  
7     appropriate character font in response to font bit map data that  
8     is included in the EPG data. ROM 37 also includes a logo data  
9     address conversion table which uses the aforementioned access  
10    data transmitted with the EPG data to read out the pre-stored  
11    logos and icons for display.

12           Therefore, it is seen that, by transmitting EPG image  
13    and text data, still image displays of the type shown in Fig. 4  
14    may be presented to the user, thereby identifying those programs  
15    which currently are being transmitted as well as those programs  
16    which will be transmitted over respective broadcast channels.  
17    The user may display more detailed information relating to those  
18    programs, such as the display in Fig. 7, by operating the  
19    appropriate buttons of remote control device 5. Indeed, the  
20    present invention provides the capability of displaying table  
21    information, such as shown in Figs. 8 and 9, or more detailed  
22    information relating to a particular program, such as shown in  
23    Fig. 10. These displays are superimposed on the video program  
24    then being received by the user's receiver/decoder, such video  
25    program being either a "normal" program or a "promotion" program,

1 as has been described. Still further, the user may position a  
2 cursor at or adjacent a particular EPG still image and then, by  
3 operating the remote control device in the manner discussed  
4 above, the tuner included in the user's receiver/decoder is tuned  
5 to the broadcast channel identified by the EPG still image at  
6 which the cursor is positioned.

7 While the present invention has been particularly shown  
8 and described with reference to preferred embodiments as well as  
9 alternatives thereto, it will be readily appreciated by those of  
10 ordinary skill in the art that various changes may be made to the  
11 invention disclosed herein without departing from the spirit and  
12 scope of this invention. It is intended that the appended claims  
13 be interpreted as including the embodiments which have been  
14 discussed above, the various alternatives which have been  
15 described as well as all equivalents thereto.  
16

What is claimed is:

1. A method of transmitting an electronic program guide (EPG) to identify programs which are to be transmitted, comprising the steps of:

generating EPG data including image data representing images of reduced, less than normal, size to identify respective programs which are to be transmitted;

providing program data constituting at least one program currently being transmitted;

combining said EPG data and said program data; and  
transmitting the combined data.

2. The method of claim 1 wherein said EPG data further includes text data representing information associated with said identified programs, said information comprising at least one of title data identifying the title of a program to be transmitted, broadcast data identifying date and time at which said program is to be transmitted and description data providing a description of the program to be transmitted.

3. The method of claim 2, further comprising the steps of providing text data associated with said at least one program currently being transmitted, combining said text data with said EPG data and said program data; and transmitting the combined EPG data, program data and text data.

4. The method of claim 3 wherein said text data associated with said at least one program currently being transmitted comprises at least one of title data identifying the title of said program currently being transmitted, category data identifying a category type of the program currently being transmitted, and transmission channel data identifying the transmission channel over which said program is currently being transmitted.

5. The method of claim 2 wherein said step of providing program data comprises supplying video and audio data of plural programs, each being transmitted over a respective broadcast channel, and compressing said video and audio data to produce compressed program data of said plural programs.

6. The method of claim 5 wherein the step of combining comprises multiplexing the EPG image and text data with said compressed program data of said plural programs, and wherein the number of programs identified by said EPG data is substantially greater than the number of programs with which said EPG data is multiplexed.

7. The method of claim 6 wherein the step of generating EPG data includes updating said EPG data periodically.

8. The method of claim 7 wherein said EPG text data comprises program table data formed of said title and broadcast data and program content data formed of said description data; and wherein said program table data is associated with programs

currently being transmitted and to be transmitted during a predetermined time period, and said program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

9. The method of claim 2 wherein said program data is provided by supplying audio data and a single frame of video data of respective programs to form promotional programs data, each promotional program being transmitted over a respective broadcast channel, and compressing said audio and video data to produce compressed promotional program data of plural promotional programs; and wherein said EPG data and the compressed promotional data are combined by multiplexing the EPG image and text data with said compressed promotional data, the title and broadcast data of said EPG text data constituting program table data and the description data of said EPG text data constituting program content data, such that the multiplexed program table data is associated with programs currently being transmitted and to be transmitted during a predetermined time period and the multiplexed program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

10. The method of claim 1 wherein the step of providing program data comprises supplying groups of program data, each group including video and audio data associated with

plural programs, each program being transmitted over a respective broadcast channel, and compressing the video and audio data of each group to produce groups of compressed program data; wherein the step of combining said EPG data and said program data comprises multiplexing said EPG data with each group of compressed program data to produce respective data output channels; and wherein the step of transmitting comprises supplying each data output channel to a respective satellite transponder for satellite transmission over respective transponder channels.

11. A method of receiving electronic program guide (EPG) and program data transmitted on plural broadcast channels, said EPG data including image data representing images of reduced, less than normal size to identify respective programs which currently are and will be transmitted on several broadcast channels and said program data including video and audio data of plural programs currently being transmitted on respective broadcast channels, said method comprising the steps of:

receiving the program data transmitted on different broadcast channels and the EPG data transmitted with said program data;

separating the received EPG data from the received program data;

storing the separated EPG data;



displaying a program represented by the separated  
program data;

selectively retrieving said stored EPG data; and  
displaying said images of reduced, less than normal  
size represented by said retrieved EPG data, the reduced size  
images being displayed in superposition over the displayed  
program.

12. The method of claim 11 wherein said retrieved EPG  
data identifies respective programs which currently are being  
transmitted; and further comprising the steps of selecting one of  
the reduced size images and displaying the program identified by  
the selected reduced size image.

13. The method of claim 11 wherein the received EPG  
data further includes text data representing information  
associated with each program identified by said image data, said  
text data being selectively retrieved from said stored EPG data  
and displayed.

14. The method of claim 13 further comprising the  
steps of selecting one of the displayed reduced size images and  
displaying the selected reduced size image and the text data  
associated with the program identified by said selected reduced  
size image.

15. The method of claim 14 wherein said text data  
includes title data identifying the title of the associated  
program, broadcast data identifying date, time and broadcast

channel at which said associated program is to be transmitted, and description data providing a description of said associated program.

16. The method of claim 13 wherein said text data comprises program table data formed of title, data, time and broadcast channel data for each of the respective programs to be transmitted.

17. The method of claim 16 wherein said text data additionally comprises program content data providing a summary of the content of each of the respective programs to be transmitted.

18. The method of claim 17 wherein said program table data is associated with programs currently being transmitted and programs to be transmitted during a predetermined time period, and said program content data is associated with said programs currently being transmitted and said programs to be transmitted during a fraction of said predetermined time period.

19. The method of claim 17 wherein the received EPG data is multiplexed with the received program data.

20. The method of claim 19 wherein the received program data is compressed and the step of receiving the program data includes the step of expanding the compressed program data.

21. The method of claim 19 wherein the EPG data and program data are received via satellite transmission channels, each satellite transmission channel comprising plural broadcast

channels multiplexed with the EPG data; and wherein the step of separating comprises demultiplexing each satellite transmission channel to recover said EPG data and the program data transmitted on each of said broadcast channels.

22. The method of claim 21 further comprising the step of storing the recovered program data transmitted on each broadcast channel; and wherein the step of displaying a program comprises selecting the stored program data that had been transmitted on a desired broadcast channel, and displaying said selected program data.

23. The method of claim 13 wherein at least one of the received broadcast channels is a promotional channel and the program data transmitted thereon is promotional video and audio data representing particular programs transmitted on several other broadcast channels.

24. The method of claim 23 wherein said text data is selectively retrieved and displayed in superposition over a promotional video display as a table of programs transmitted on non-promotional broadcast channels.

25. The method of claim 23 wherein said text data is selectively retrieved and displayed in superposition over a promotional video display as a table of programs to be transmitted on a selected non-promotional broadcast channel.

26. The method of claim 23 wherein said text data is selectively retrieved and displayed in superposition over a

promotional video display as a description of a selected program to be transmitted on a non-promotional broadcast channel.

27. The method of claim 13 further comprising the steps of displaying a text window superimposed over said displayed program; selecting one of the displayed reduced size images; and displaying in said text window said text data representing information associated with the program identified by said selected reduced size image.

28. The method of claim 27 wherein the text data displayed in said text window includes title of said identified program and broadcast channel over which said identified program is transmitted.

29. The method of claim 11, further comprising the steps of pre-storing predetermined display indicia; receiving as part of said EPG data access information for accessing selected display indicia; reading out said selected display indicia in response to the received access information; and displaying said selected display indicia in superposition over said displayed program.

30. Apparatus for transmitting an electronic program guide (EPG) to identify programs which are to be transmitted, comprising:

generating means for generating EPG data including image data representing images of reduced, less than normal, size to identify respective programs which are to be transmitted;

a source of program data constituting at least one program currently being transmitted;

combining means for combining said EPG data and said program data; and

transmission means for transmitting the combined data.

31. The apparatus of claim 30 wherein said EPG data further includes text data representing information associated with said identified programs, said information comprising at least one of title data identifying the title of a program to be transmitted, broadcast data identifying date and time at which said program is to be transmitted and description data providing a description of the program to be transmitted.

32. The apparatus of claim 31, further comprising means for generating text data associated with said at least one program currently being transmitted; and means for combining said text data with said EPG data and said program data; and wherein said transmission means transmits the combined EPG data, program data and text data.

33. The apparatus of claim 32 wherein said text data associated with said at least one program comprises at least one of title data identifying the title of the program currently being transmitted, category data identifying a category type of the program currently being transmitted, and transmission channel data identifying the transmission channel over which said program is currently being transmitted.

34. The apparatus of claim 31 wherein said source of program data comprises means for supplying video and audio data of plural programs, each being transmitted over a respective broadcast channel, and data compression means for compressing said video and audio data to produce compressed program data of said plural programs.

35. The apparatus of claim 34 wherein said combining means comprises multiplexing means for multiplexing the EPG image and text data with said compressed program data of said plural programs, and wherein the number of programs identified by said EPG data is substantially greater than the number of programs with which said EPG data is multiplexed.

36. The apparatus of claim 35 wherein said generating means is operable to update said EPG data periodically.

37. The apparatus of claim 36 wherein said EPG text data comprises program table data formed of said title and broadcast data and program content data formed of said description data; and wherein said program table data is associated with programs currently being transmitted and to be transmitted during a predetermined time period, and said program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

38. The apparatus of claim 31 wherein said source of program data comprises promotion data generating means for

supplying audio data and a single frame of video data of respective programs to form promotional programs data, each promotional program being transmitted over a respective broadcast channel, and promotion data compression means for compressing said audio and video data to produce compressed promotional program data of plural promotional programs; and wherein said combining means comprises multiplexing means for multiplexing the EPG image and text data with said compressed promotional data, the title and broadcast data of said EPG text data constituting program table data and the description data of said EPG text data constituting program content data, such that the multiplexed program table data is associated with programs currently being transmitted and to be transmitted during a predetermined time period and the multiplexed program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

39. The apparatus of claim 30 wherein said source of program data comprises means for supplying groups of program data, each group including video and audio data associated with plural programs, each program being transmitted over a respective broadcast channel, and means for compressing the video and audio data of each group to produce groups of compressed program data; wherein said combining means comprises means for multiplexing said EPG data with each group of compressed program data to produce respective data output channels; and wherein said

transmission means comprises satellite transponders and means supplying each data output channel to a respective satellite transponder for satellite transmission over respective transponder channels.

40. Apparatus for receiving electronic program guide (EPG) and program data transmitted on plural broadcast channels, said EPG data including image data representing images of reduced, less than normal size to identify respective programs which currently are and will be transmitted on several broadcast channels and said program data including video and audio data of plural programs currently being transmitted on respective broadcast channels, said apparatus comprising:

receiving means for receiving the program data transmitted on different broadcast channels and the EPG data transmitted with said program data;

separating means for separating the received EPG data from the received program data;

storage means for storing the separated EPG data;

display means for displaying a program represented by the separated program data;

read-out means for selectively retrieving said EPG data from said storage means; and

means for displaying on said display means said images of reduced, less than normal size represented by said retrieved EPG data in superposition over the displayed program.



41. The apparatus of claim 40 wherein the received EPG data further includes text data representing information associated with each program identified by said image data; and said read-out means is operable to retrieve said text data from said storage means and supply the retrieved text data to said display means.

42. The apparatus of claim 41 further comprising image selecting means for selecting one of the displayed reduced size images to cause said read-out means to retrieve from said storage means the text data associated with the program identified by said selected reduced size image for display therewith.

43. The apparatus of claim 42 wherein said text data includes title data identifying the title of the associated program, broadcast data identifying data, time and broadcast channel at which said associated program is to be transmitted, and description data providing a description of said associated program.

44. The apparatus of claim 42 wherein said image selecting means comprises a cursor and cursor control means operable by a user to position said cursor at a desired one of the displayed reduced size images and thereby select said desired reduced size image.

45. The apparatus of claim 40 wherein said retrieved EPG data identifies respective programs which currently are being transmitted; and further comprising image selecting means for

selecting one of the displayed reduced size images and tuning means for tuning said apparatus to the broadcast channel which transmits the program identified by the selected reduced size image.

46. The apparatus of claim 41 wherein said text data comprises program table data formed of title, data, time and broadcast channel data for each of the respective programs to be transmitted.

47. The apparatus of claim 46 wherein said text data additionally comprises program content data providing a summary of the content of each of the respective programs to be transmitted.

48. The apparatus of claim 47 wherein said program table data is associated with programs currently being transmitted and programs to be transmitted during a predetermined time period, and said program content data is associated with said programs currently being transmitted and said programs to be transmitted during a fraction of said predetermined time period.

49. The apparatus of claim 47 wherein the received EPG data is multiplexed with the received program data.

50. The apparatus of claim 49 wherein the received program data is compressed and the receiving means includes decompressing means for expanding the compressed program data.

51. The apparatus of claim 49 wherein the EPG data and program data are received via satellite transmission channels,

each satellite transmission channel comprising plural broadcast channels multiplexed with the EPG data; and wherein the separating means comprises demultiplexing means for demultiplexing each satellite transmission channel to recover said EPG data and the program data transmitted on each of said broadcast channels.

52. The apparatus of claim 51 further comprising tuning means for tuning said apparatus to a selected broadcast channel; memory means for storing the recovered program data transmitted on the selected broadcast channel; and means for reading out the program data stored in said memory means and supplying same to said display means to display said read out program data.

53. The apparatus of claim 41 wherein at least one of the received broadcast channels is a promotional channel and the program data transmitted thereon is promotional video and audio data representing particular programs transmitted on several other broadcast channels.

54. The apparatus of claim 53 wherein said display means is operable to display the retrieved text data in superposition over a promotional video display as a table of programs transmitted on non-promotional broadcast channels.

55. The apparatus of claim 53 wherein said display means is operable to display the retrieved text data in superposition over a promotional video display as a table of

programs to be transmitted on a selected non-promotional broadcast channel.

56. The apparatus of claim 53 wherein said display means is operable to display the retrieved text data in superposition over a promotional video display as a description of a selected program to be transmitted on a non-promotional broadcast channel.

57. The apparatus of claim 40, further comprising a memory for pre-storing predetermined display indicia, said receiving means being operable to receive as part of said EPG data access information for accessing selected display indicia, said read-out means being operable to read out said selected display indicia in response to the received access information; and said display means being operable to display said selected display indicia in superposition over said displayed program.

58. The apparatus of claim 41 wherein said display means is operable to display a text window superimposed over said displayed program; and further comprising image selecting means for selecting one of the displayed reduced size images to cause said read-out means to retrieve said text data representing information associated with the program identified by said selected reduced size image for display in said text window.

59. The apparatus of claim 58 wherein the text data displayed in said text window includes title of said identified program and broadcast channel over which said identified program is transmitted.

60. A method of transmitting and receiving an electronic program guide (EPG) to identify programs which are to be transmitted, comprising the steps of:

generating EPG data including image data representing images of reduced, less than normal, size to identify respective programs which are to be transmitted;

providing program data constituting at least one program currently being transmitted;

combining said EPG data and said program data;

transmitting the combined data;

receiving the combined program and EPG data;

separating the received EPG data from the received program data;

storing the separated EPG data;

displaying the program represented by the separated program data;

selectively retrieving said stored EPG data; and

displaying said images of reduced, less than normal size represented by said retrieved EPG data, the reduced size images being displayed in superposition over the displayed program.

61. The method of claim 60 wherein said EPG data further includes text data representing information associated with said identified programs, said information comprising at least one of title data identifying the title of a program to be transmitted, broadcast data identifying date and time at which said program is to be transmitted and description data providing a description of the program to be transmitted.

62. The method of claim 61 wherein said step of providing program data comprises supplying video and audio data of plural programs, each being transmitted over a respective broadcast channel, and compressing said video and audio data to produce compressed program data of said plural programs.

63. The method of claim 62 wherein the step of combining comprises multiplexing the EPG image and text data with said compressed program data of said plural programs, and wherein the number of programs identified by said EPG data is substantially greater than the number of programs with which said EPG data is multiplexed.

64. The method of claim 61 wherein said program data is provided by supplying audio data and a single frame of video data of respective programs to form promotional programs data, each promotional program being transmitted over a respective broadcast channel, and compressing said audio and video data to produce compressed promotional program data of plural promotional programs; and wherein said EPG data and the compressed

promotional data are combined by multiplexing the EPG image and text data with said compressed promotional data, the title and broadcast data of said EPG text data constituting program table data and the description data of said EPG text data constituting program content data, such that the multiplexed program table data is associated with programs currently being transmitted and to be transmitted during a predetermined time period and the multiplexed program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

65. The method of claim 60 wherein the step of providing program data comprises supplying groups of program data, each group including video and audio data associated with plural programs, each program being transmitted over a respective broadcast channel, and compressing the video and audio data of each group to produce groups of compressed program data; wherein the step of combining said EPG data and said program data comprises multiplexing said EPG data with each group of compressed program data to produce respective data output channels; and wherein the step of transmitting comprises supplying each data output channel to a respective satellite transponder for satellite transmission over respective transponder channels.

66. The method of claim 60 further comprising the steps of selecting one of the displayed reduced size images and

displaying the program identified by the selected reduced size image.

67. The method of claim 66 wherein the EPG data further includes text data representing information associated with each program identified by said image data, said text data being selectively retrieved from said stored EPG data and displayed; and further comprising the step of displaying the selected reduced size image and the text data associated with the program identified by said selected reduced size image.

68. The method of claim 67 wherein the combined EPG and program data are multiplexed together and the received program data is compressed; and wherein the step of receiving the program data includes the step of expanding the compressed program data.

69. The method of claim 68 further comprising the step of storing the received program data; and wherein the step of displaying the program comprises selecting stored program data that had been transmitted on a desired broadcast channel, and displaying said selected program data.

70. The method of claim 60 wherein plural broadcast channels of program data are transmitted; and at least one of the received broadcast channels is a promotional channel and the program data transmitted thereon is promotional video and audio data representing particular programs transmitted on several other broadcast channels.



71. The method of claim 67 further comprising the steps of displaying a text window superimposed over said displayed program; selecting one of the displayed reduced size images; and displaying in said text window said text data representing information associated with the program identified by said selected reduced size image.

72. The method of claim 60, further comprising the steps of pre-storing predetermined display indicia; transmitting as part of said EPG data access information for accessing selected display indicia; reading out said selected display indicia in response to received access information; and displaying said selected display indicia in superposition over said displayed program.

73. Apparatus for transmitting and receiving an electronic program guide (EPG) to identify programs which are to be transmitted, comprising:

generating means for generating EPG data including image data representing images of reduced, less than normal, size to identify respective programs which are to be transmitted;

a source of program data constituting at least one program currently being transmitted;

combining means for combining said EPG data and said program data;

transmission means for transmitting the combined data;

receiving means for receiving the combined program and EPG data;

separating means for separating the received EPG data from the received program data;

storage means for storing the separated EPG data;

display means for displaying the program represented by the separated program data;

read-out means for selectively retrieving said EPG data from said storage means; and

means for displaying on said display means said images of reduced, less than normal size represented by said retrieved EPG data in superposition over the displayed program.

74. The apparatus of claim 73 wherein said EPG data further includes text data representing information associated with said identified programs, said information comprising at least one of title data identifying the title of a program to be transmitted, broadcast data identifying date and time at which said program is to be transmitted and description data providing a description of the program to be transmitted.

75. The apparatus of claim 74 wherein said source of program data comprises means for supplying video and audio data of plural programs, each being transmitted over a respective broadcast channel, and data compression means for compressing said video and audio data to produce compressed program data of said plural programs.

76. The apparatus of claim 75 wherein said combining means comprises multiplexing means for multiplexing the EPG image and text data with said compressed program data of said plural programs, and wherein the number of programs identified by said EPG data is substantially greater than the number of programs with which said EPG data is multiplexed.

77. The apparatus of claim 71 wherein said source of program data comprises promotion data generating means for supplying audio data and a single frame of video data of respective programs to form promotional programs data, each promotional program being transmitted over a respective broadcast channel, and promotion data compression means for compressing said audio and video data to produce compressed promotional program data of plural promotional programs; and wherein said combining means comprises multiplexing means for multiplexing the EPG image and text data with said compressed promotional data, the title and broadcast data of said EPG text data constituting program table data and the description data of said EPG text data constituting program content data, such that the multiplexed program table data is associated with programs currently being transmitted and to be transmitted during a predetermined time period and the multiplexed program content data is associated with said programs currently being transmitted and to be transmitted during a fraction of said predetermined time period.

78. The apparatus of claim 73 wherein said source of program data comprises means for supplying groups of program data, each group including video and audio data associated with plural programs, each program being transmitted over a respective broadcast channel, and means for compressing the video and audio data of each group to produce groups of compressed program data; wherein said combining means comprises means for multiplexing said EPG data with each group of compressed program data to produce respective data output channels; and wherein said transmission means comprises satellite transponders and means supplying each data output channel to a respective satellite transponder for satellite transmission over respective transponder channels.

79. The apparatus of claim 74 further comprising image selecting means for selecting one of the displayed reduced size images to cause said read-out means to retrieve from said storage means the text data associated with the program identified by said selected reduced size image for display therewith.

80. The apparatus of claim 79 wherein said image selecting means comprises a cursor and cursor control means operable by a user to position said cursor at a desired one of the displayed reduced size images and thereby select said desired reduced size image.

81. The apparatus of claim 80 wherein the combined EPG and program data are multiplexed together and the received

program data is compressed; and wherein the receiving means includes decompressing means for expanding the compressed program data.

82. The apparatus of claim 81 wherein the transmission means transmits the EPG data and program data via satellite transmission channels, each satellite transmission channel comprising plural broadcast channels multiplexed with the EPG data; and wherein the separating means comprises demultiplexing means for demultiplexing each satellite transmission channel to recover said EPG data and the program data transmitted on each of said broadcast channels.

83. The apparatus of claim 82 further comprising tuning means for tuning said apparatus to a selected broadcast channel; memory means for storing the recovered program data transmitted on the selected broadcast channel; and means for reading out the program data stored in said memory means and supplying same to said display means to display said read out program data.

84. The apparatus of claim 82 wherein at least one of the transmitted broadcast channels is a promotional channel and the program data transmitted thereon is promotional video and audio data representing particular programs transmitted on several other broadcast channels.

85. The apparatus of claim 73, wherein said storage means includes a memory for pre-storing predetermined display

indicia, said generating means being operable to generate as part of said EPG data access information for accessing selected display indicia; said read-out means being operable to read out said selected display indicia in response to received access information; and said display means being operable to display said selected display indicia in superposition over said displayed program.

86. The apparatus of claim 74 wherein said display means is operable to display a text window superimposed over said displayed program; and further comprising image selecting means for selecting one of the displayed reduced size images to cause said read-out means to retrieve said text data representing information associated with the program identified by said selected reduced size image for display in said text window.

ABSTRACT OF THE DISCLOSURE

A technique for transmitting and receiving an electronic program guide which identifies programs that are to be transmitted. Electronic program guide (EPG) data includes image data representing images of reduced, less than normal, size to identify respective programs which are to be transmitted. The EPG data is combined with program data, the latter representing different programs transmitted on different broadcast channels, and the combined data is transmitted. On reception, the EPG data is separated from the received program data and the images of reduced, less than normal size represented by the EPG data are displayed in superposition over the received program.

FIG. 1

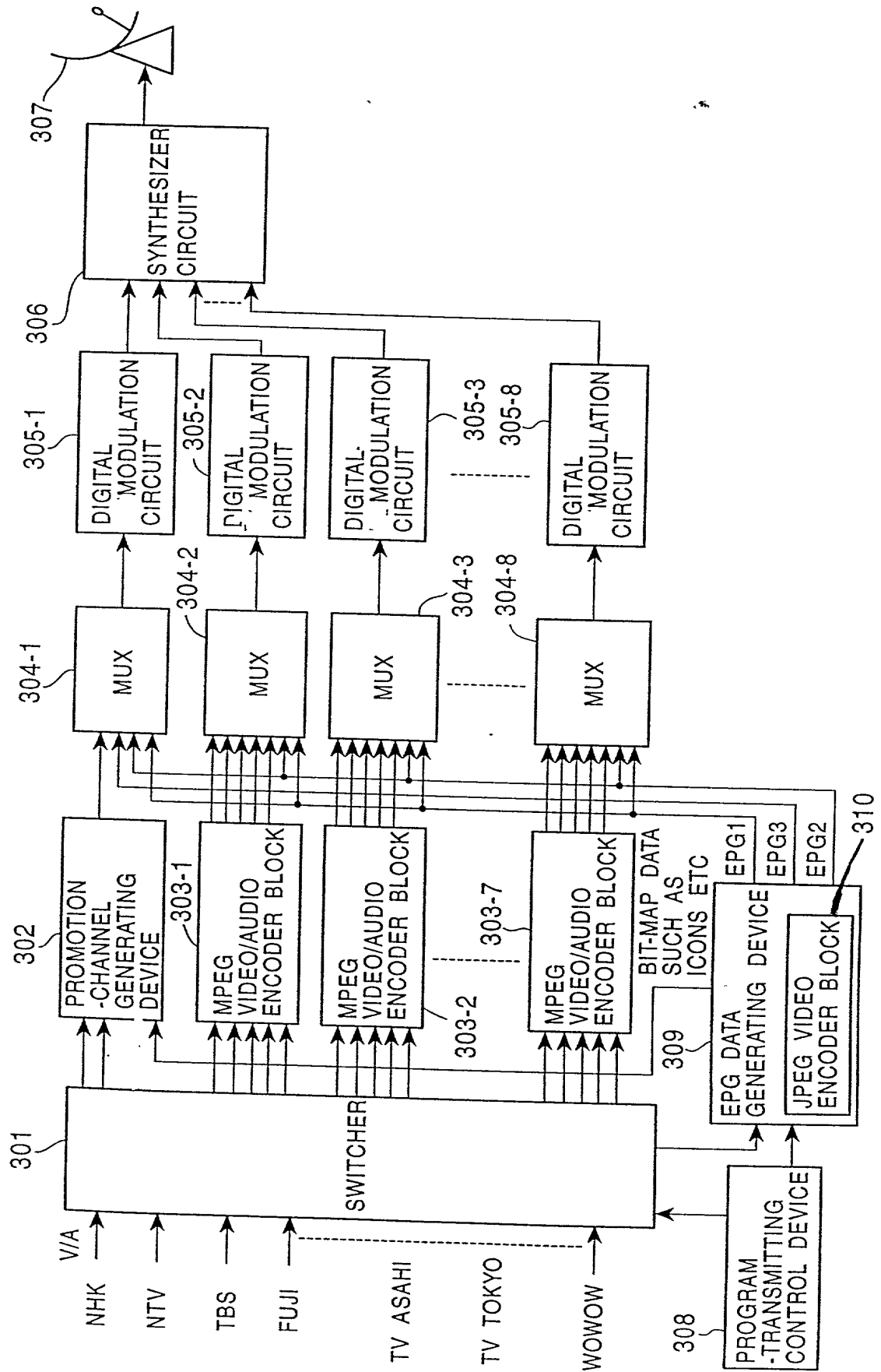




FIG. 2

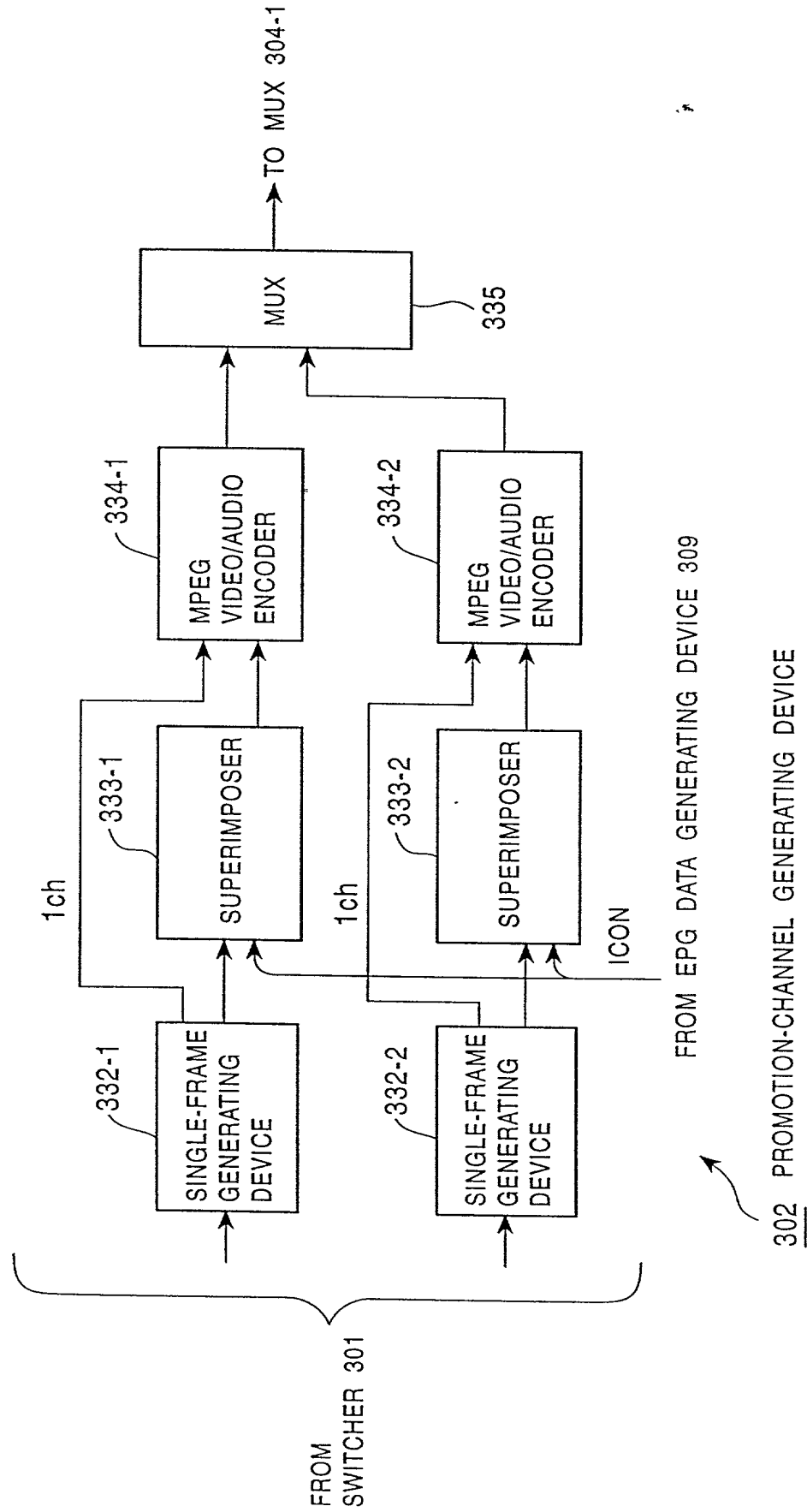


FIG.3

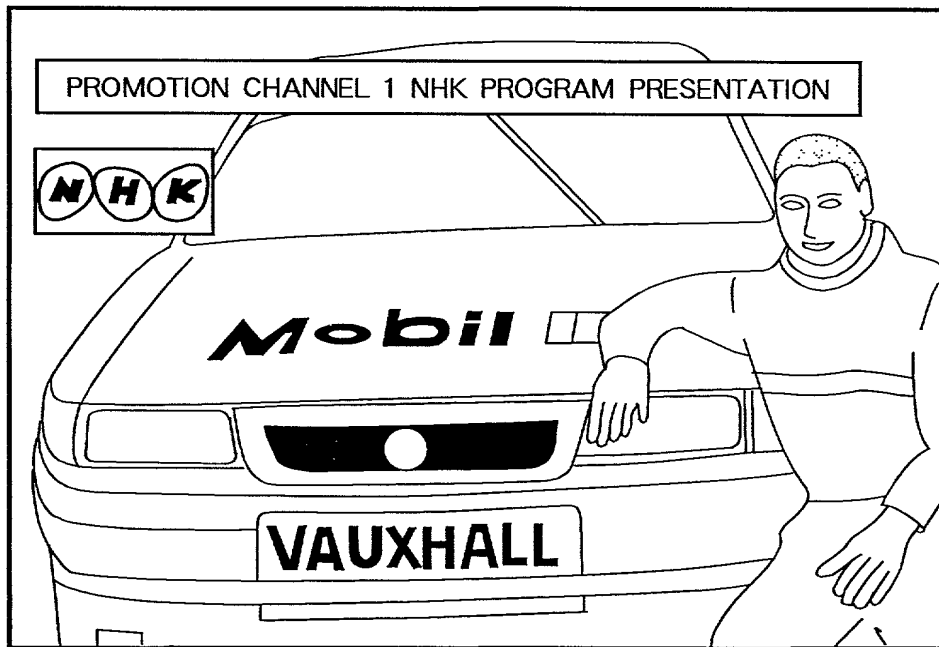


FIG. 4

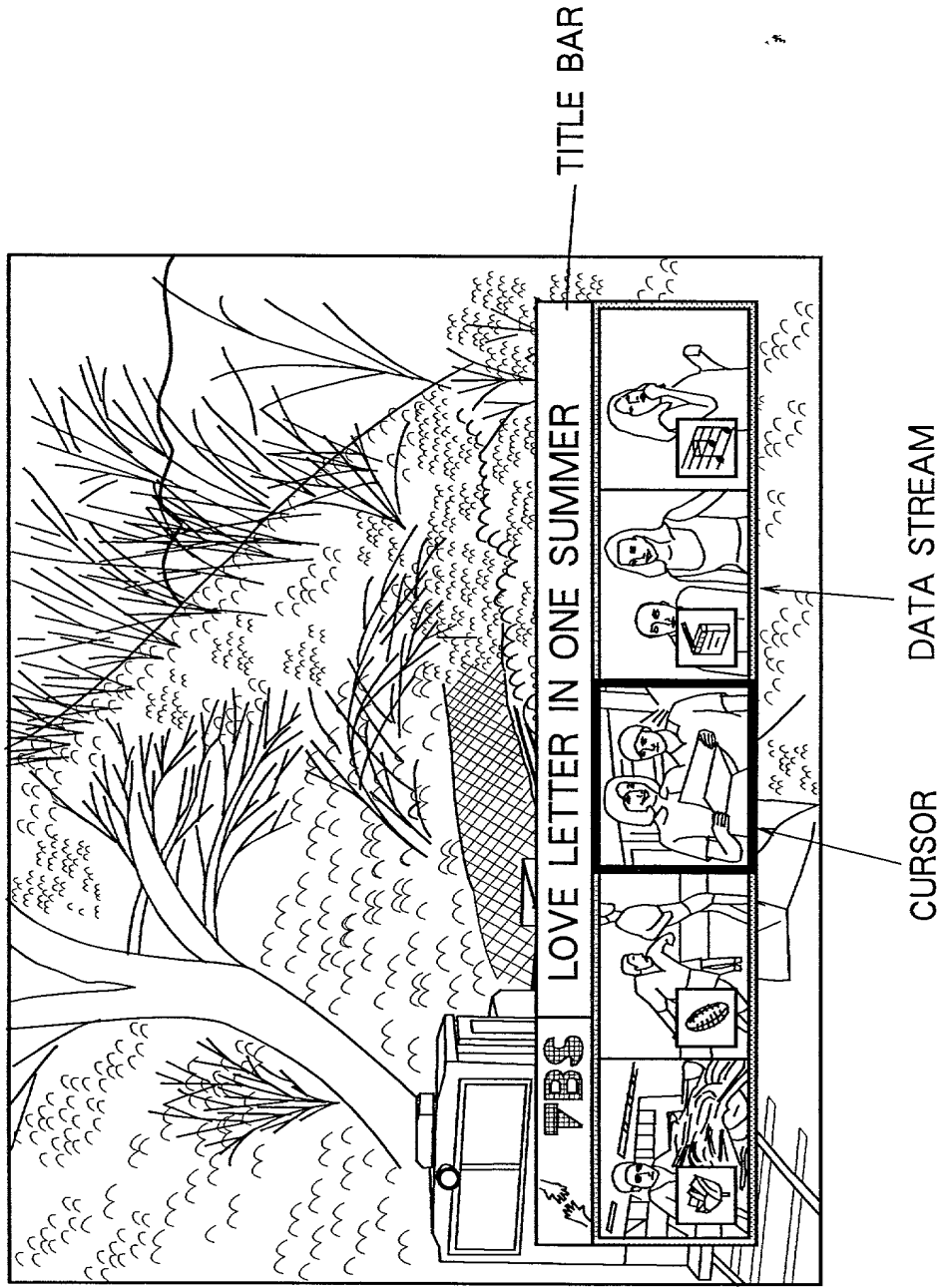
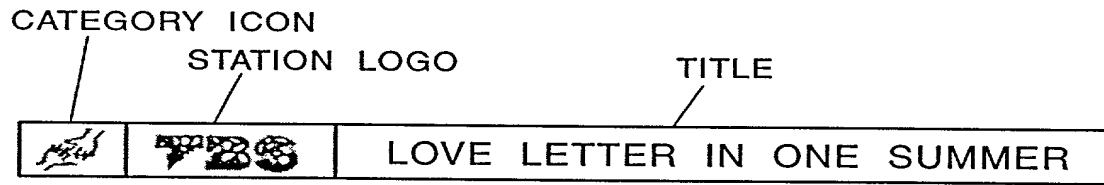
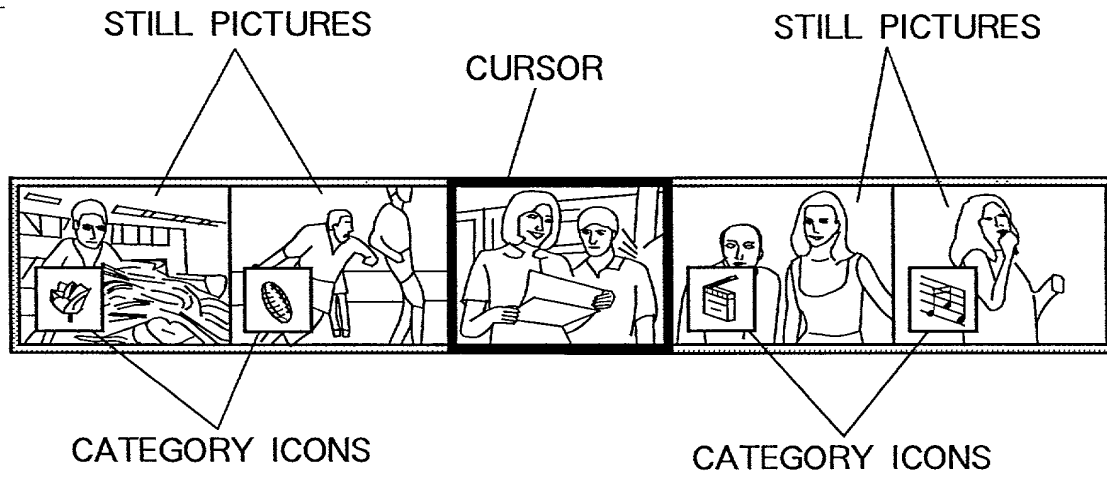


FIG. 5



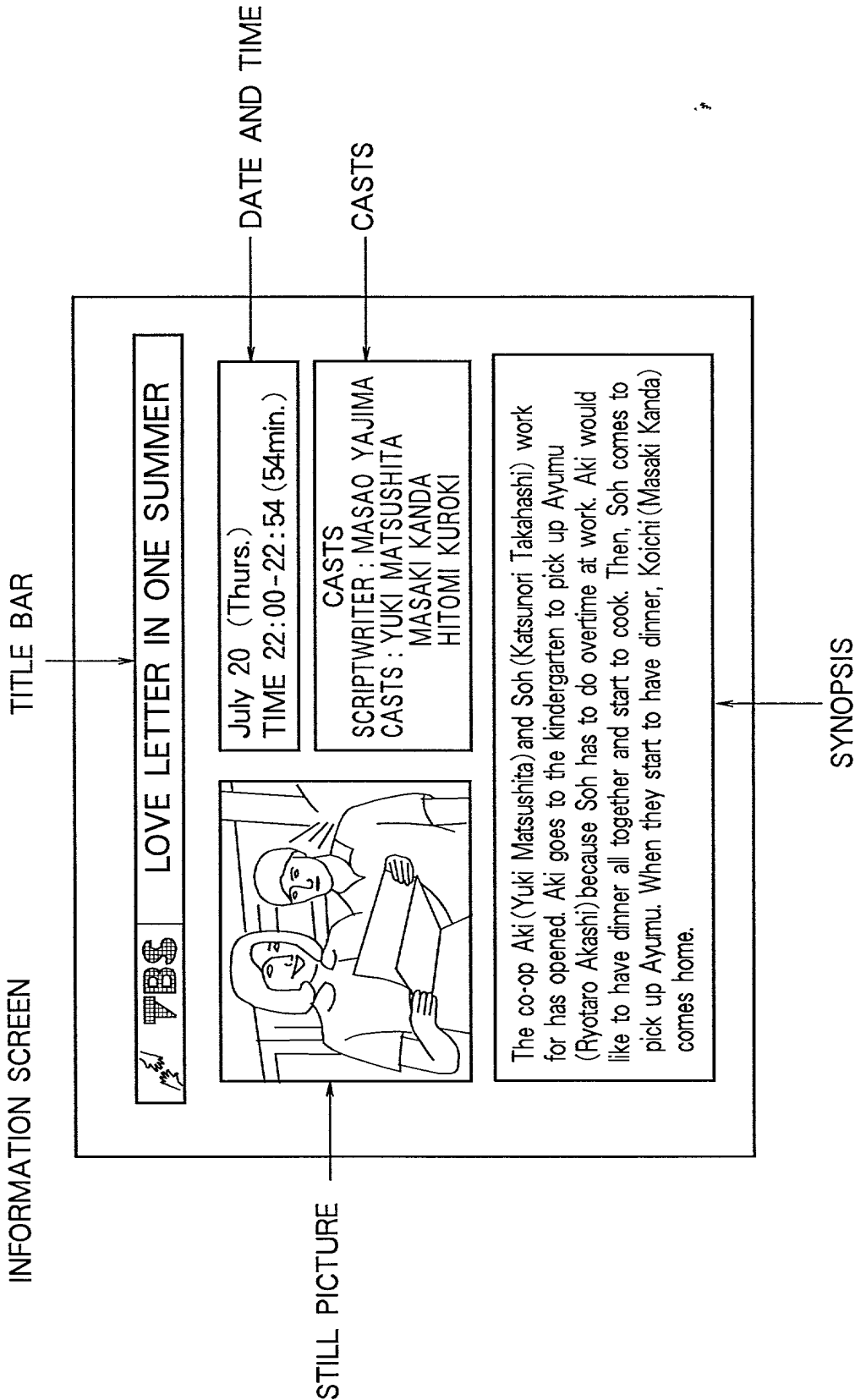
TITLE BAR

FIG. 6



PROGRAM WINDOW

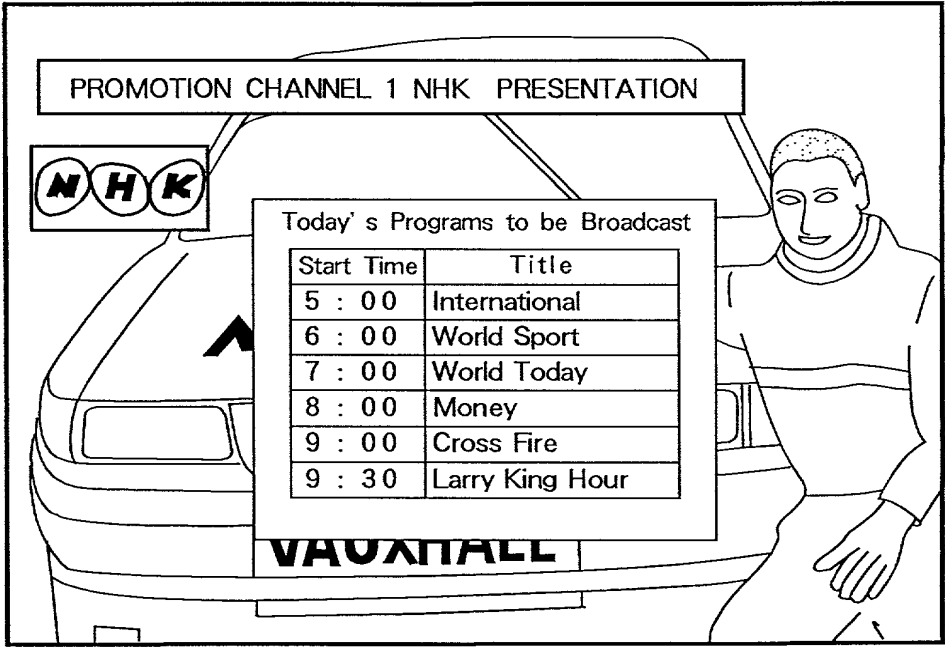
FIG. 7



...

[illegible]

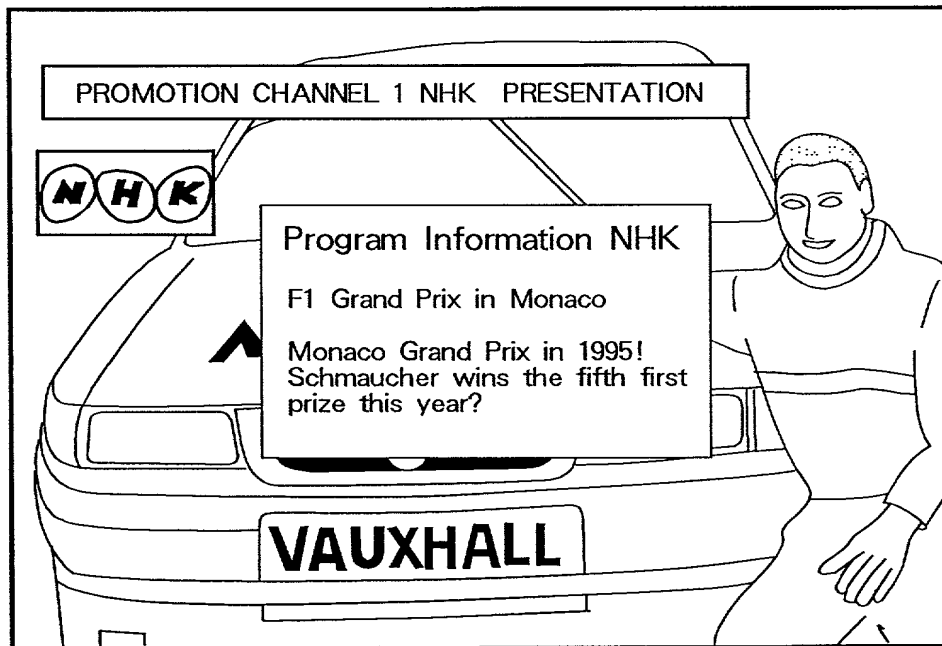
FIG.9



CHANNEL PROGRAM TABLE  
(BRIEF PROGRAM EXPLANATION)



FIG.10



DETAILED PROGRAM EXPLANATION

FIG. 11A

## NORMAL TRANSPONDER

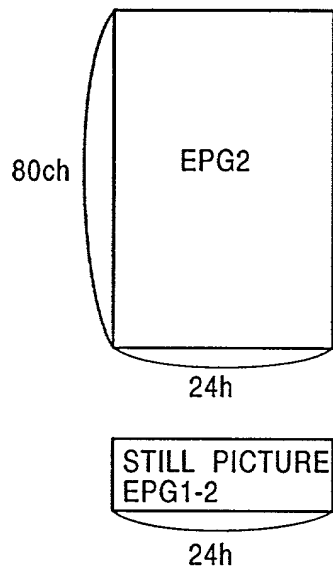
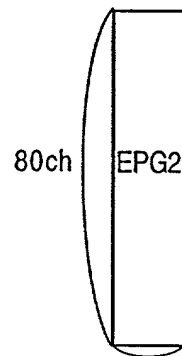
PROGRAM TABLE  
(BRIEF PROGRAM EXPLANATION)PROGRAM CONTENT  
(DETAILED PROGRAM EXPLANATION)INCLUDING SUBSEQUENT  
PROGRAM

FIG. 11B

## GUIDE TRANSPONDER

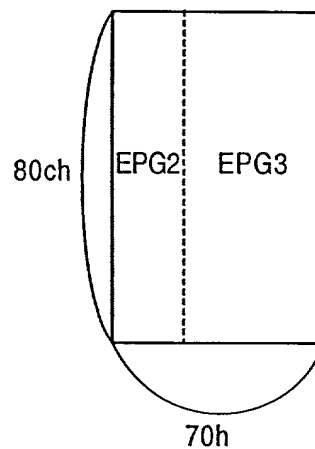
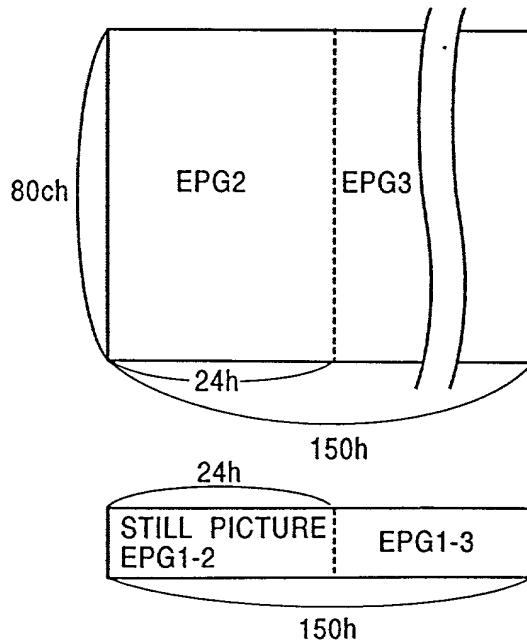
INCLUDING SUBSEQUENT  
PROGRAM

FIG. 12

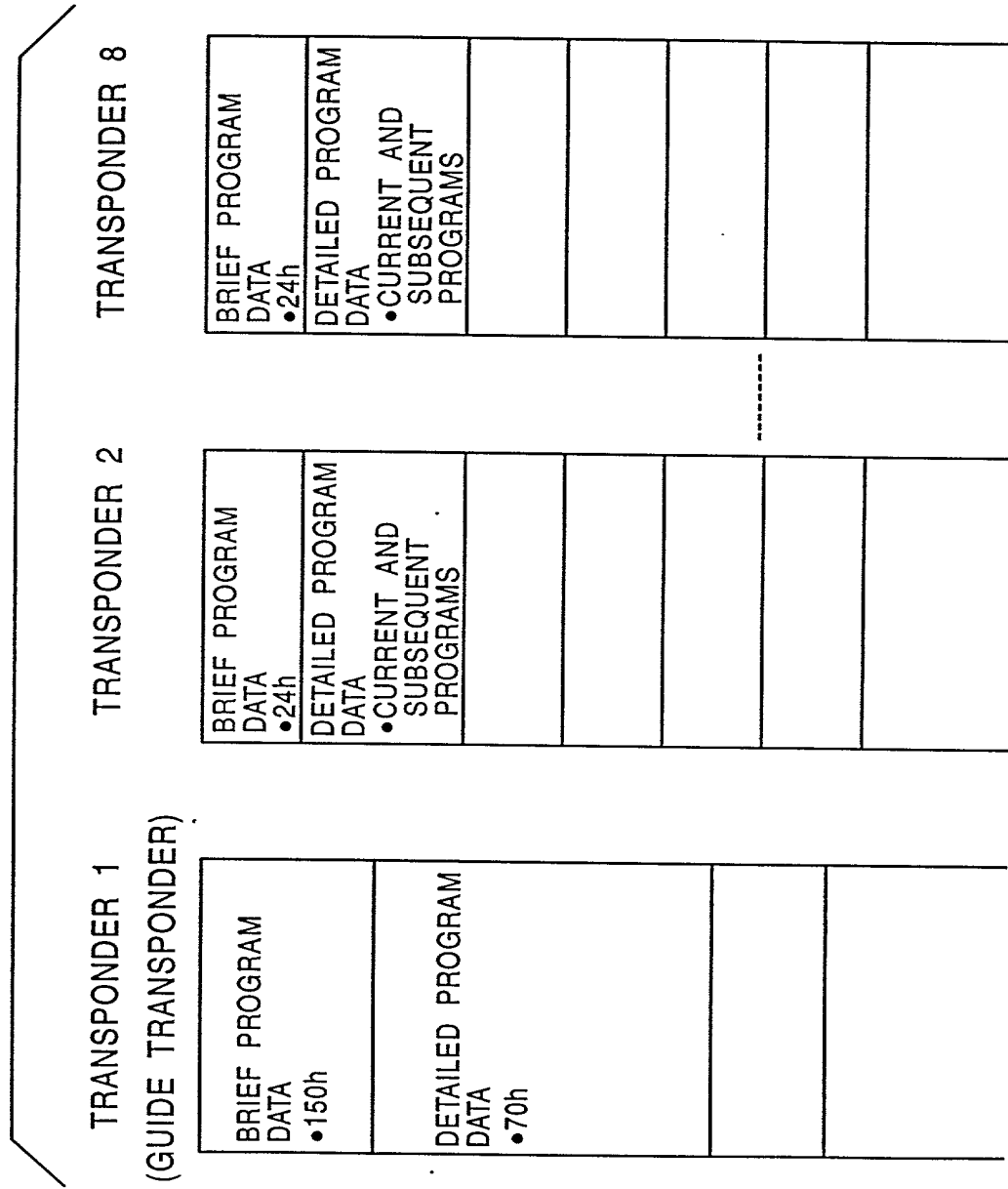


FIG. 13

ITEM	(item,)descriptor(TABLE)	DATA LENGTH	REMARKS
SERVICE PROVIDER	(service_provider)Service Descriptor(SDT)	1 byte	DATA UNDEFINED  CORRESPONDING TO EACH COUNTRY NUMBER
SERVICE NAME	(service_name)Service Descriptor(SDT)	60 byte	
SERVICE TYPE	(service_type)Service Descriptor(SDT)	1 byte	
TITLE	(event_name)Short Event Descriptor(EIT)	5 byte.	
SUBTITLE(TYPE)	(Component Descriptor(EIT)	5 byte	
CURRENT DATE AND TIME	UTC_time(TDT)	3 byte	
PROGRAM START TIME	start_time(EIT)	1(+3)byte	
PROGRAM DURATION (END TIME)	End_time(EIT)	1 byte	
PARENTAL RATE	Parental Rating Descriptor(EIT)	3 byte	
PRICE	Component Descriptor(EIT)	2 byte	
VIDEO MODE	ISO639 language Descriptor(PMT)	64 byte	
PROVIDE LANGUAGE	Component Descriptor(EIT)	256 byte	
PROVIDE SOUND MODE	Content Descriptor(EIT)		
CATEGORY	Short Event Descriptor(EIT)		
BRIEF PROGRAM EXPLANATION	Extended Event Descriptor(EIT)		
DETAILED PROGRAM EXPLANATION	Promotion Descriptor(SDT)		
PROMOTION INFORMATION			

FIG. 14

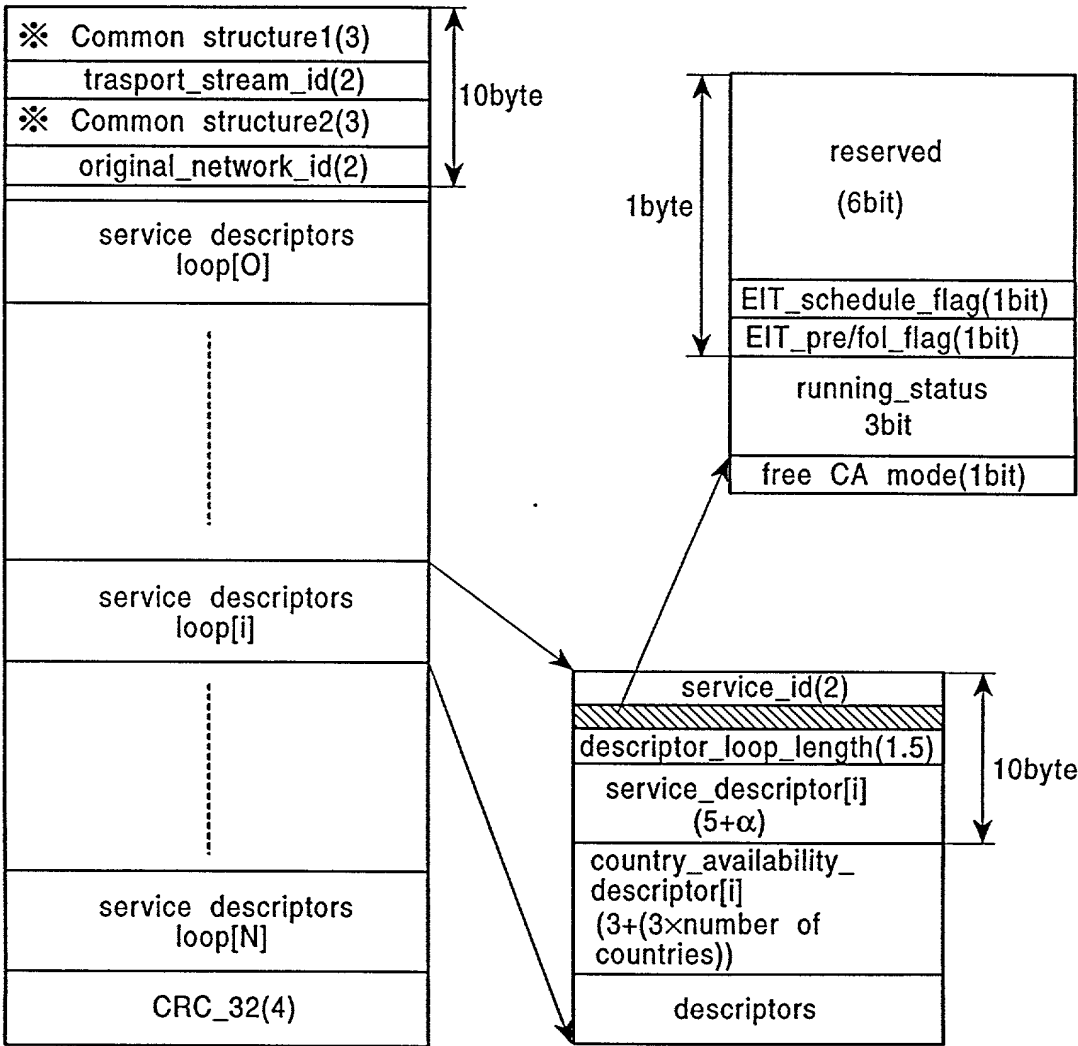


FIG. 15

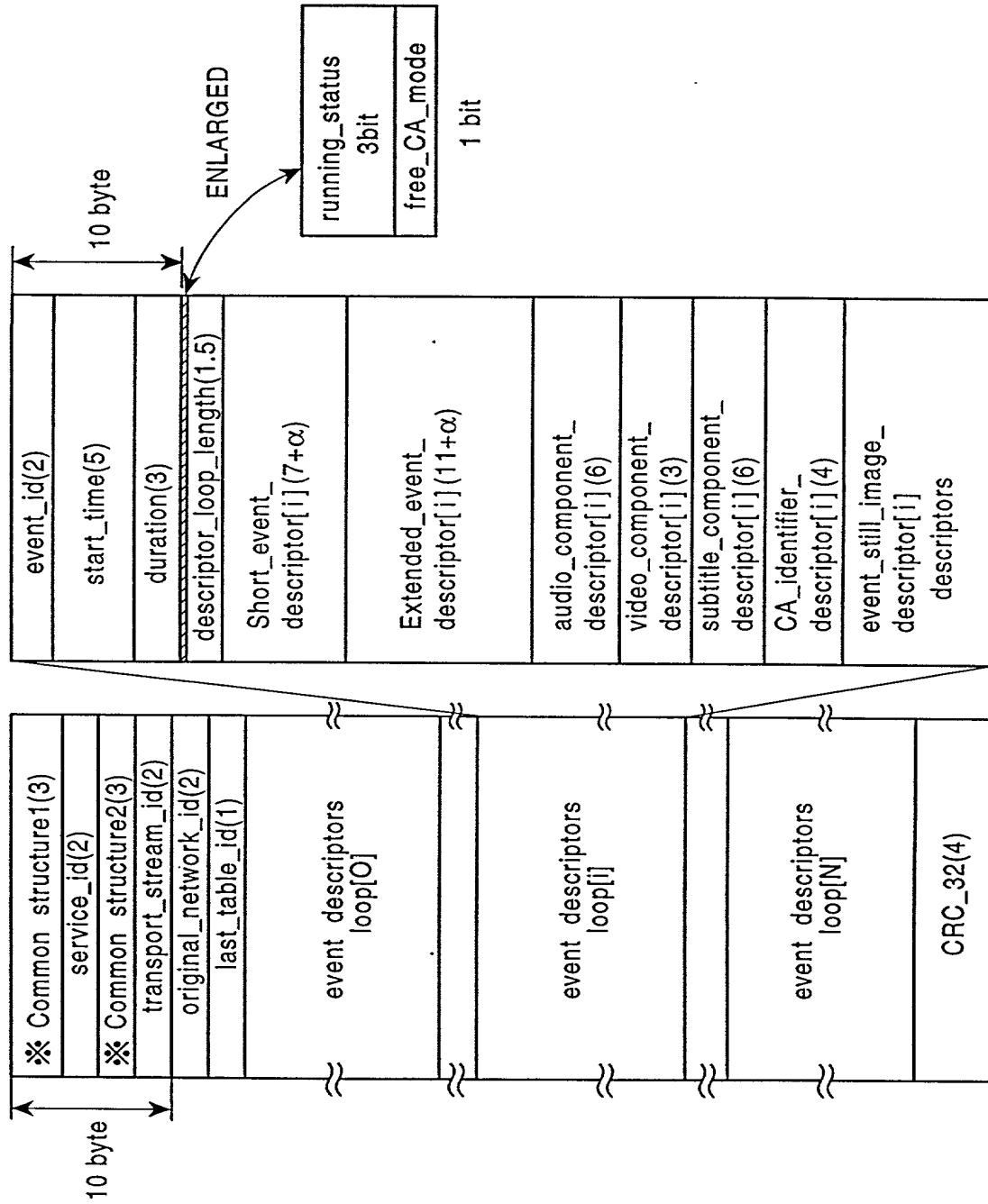


FIG. 16

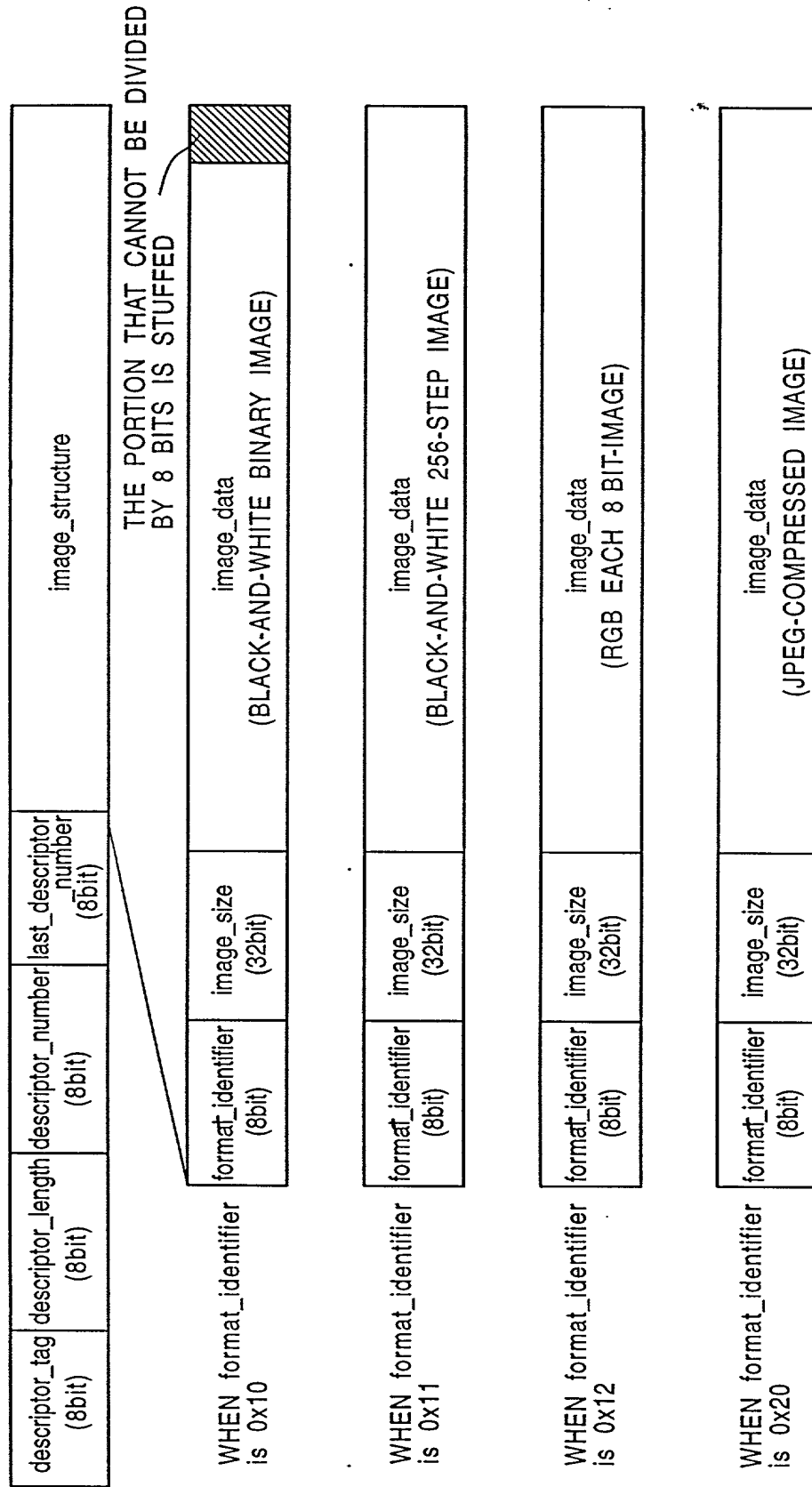


FIG. 17

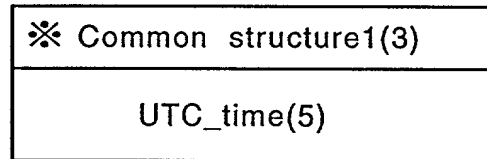


FIG. 18

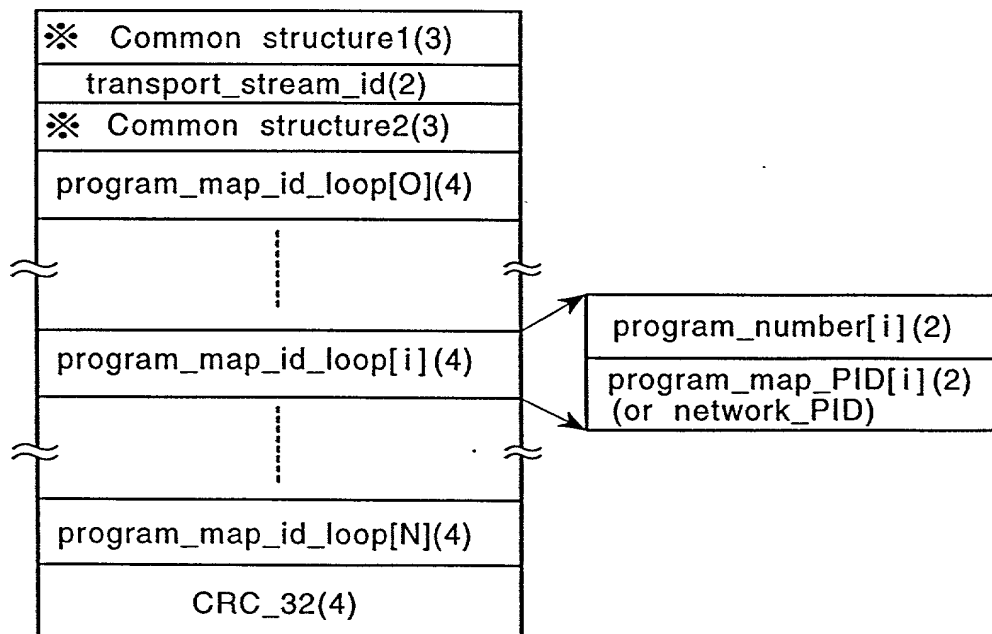




FIG. 19

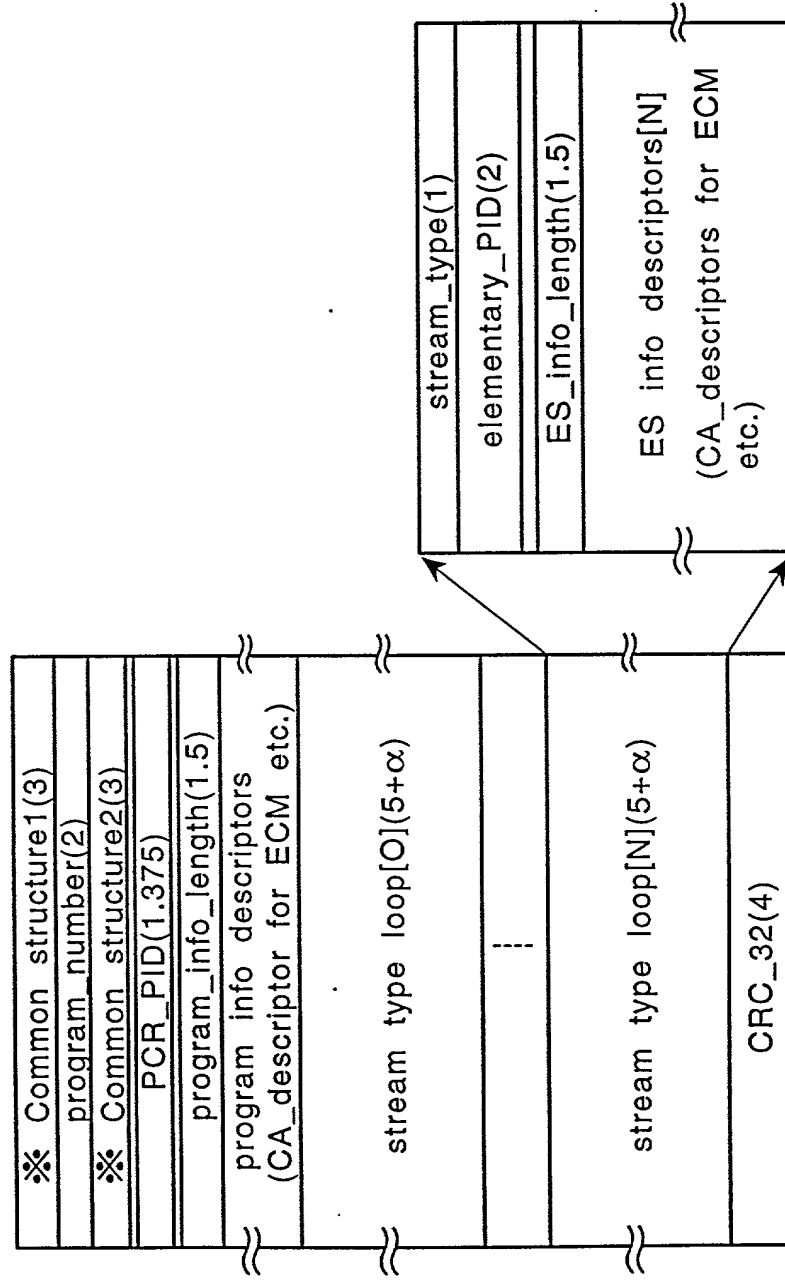


FIG.20

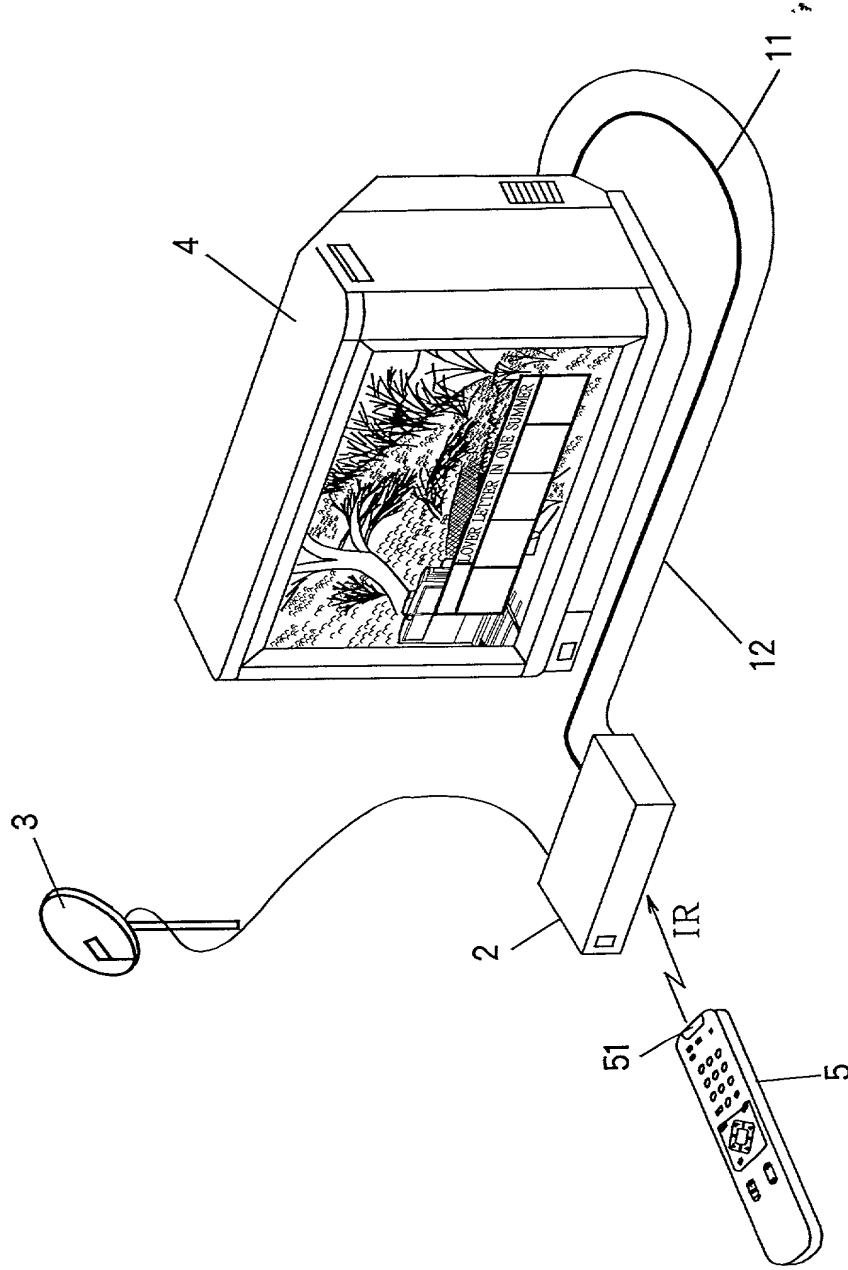


FIG. 21

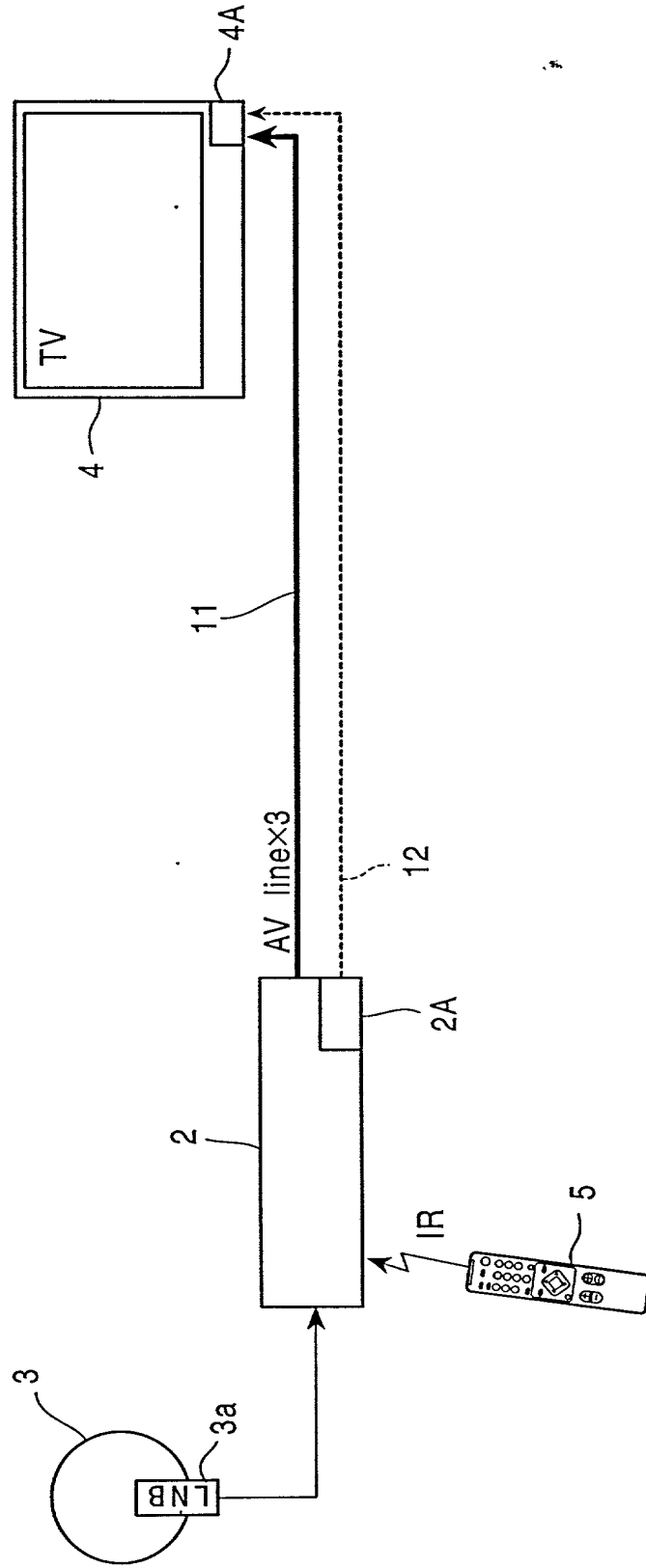


FIG. 22

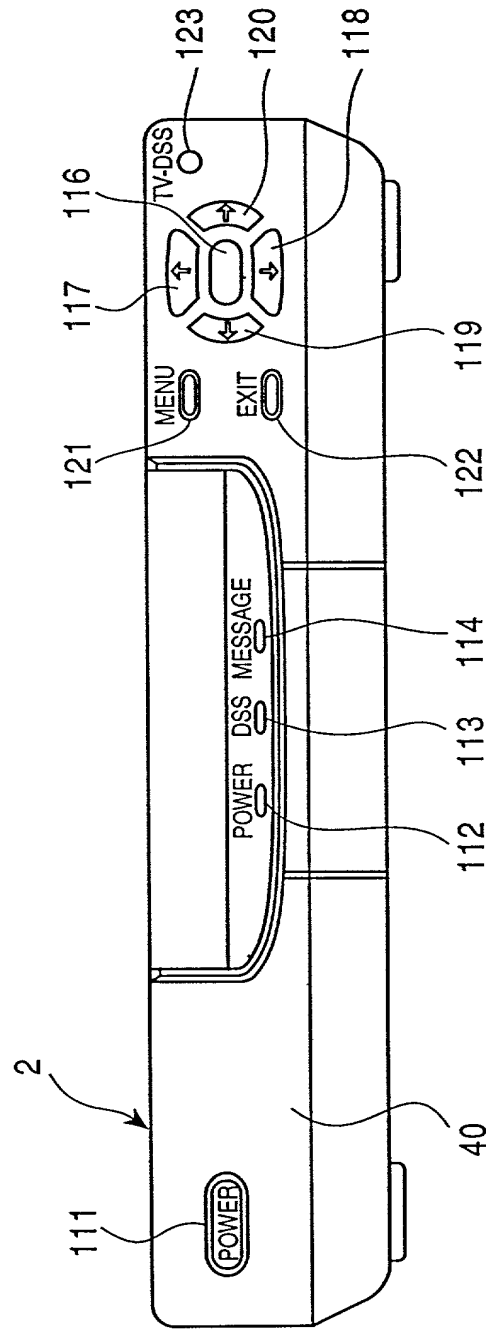


FIG. 23

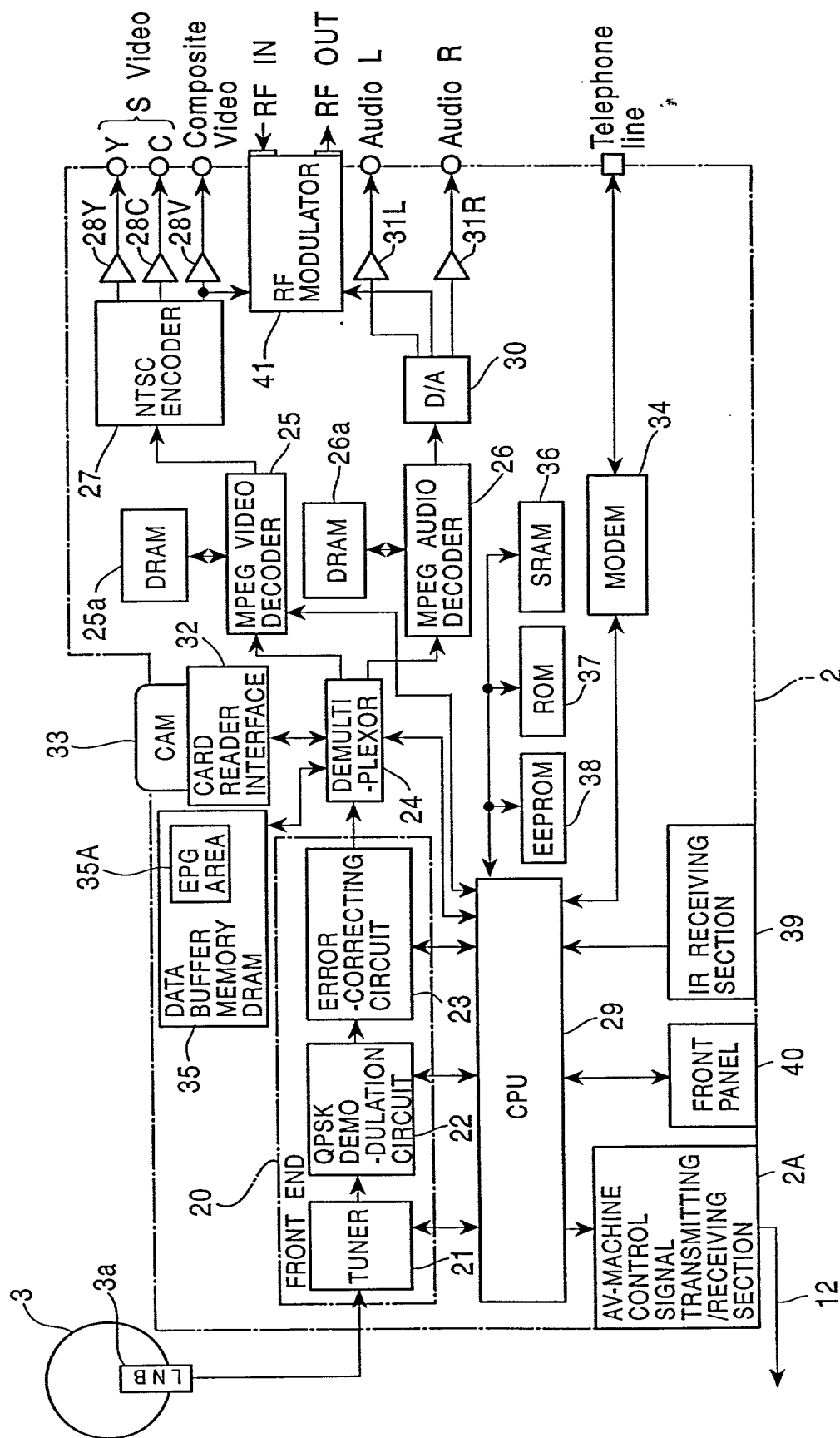




FIG. 25

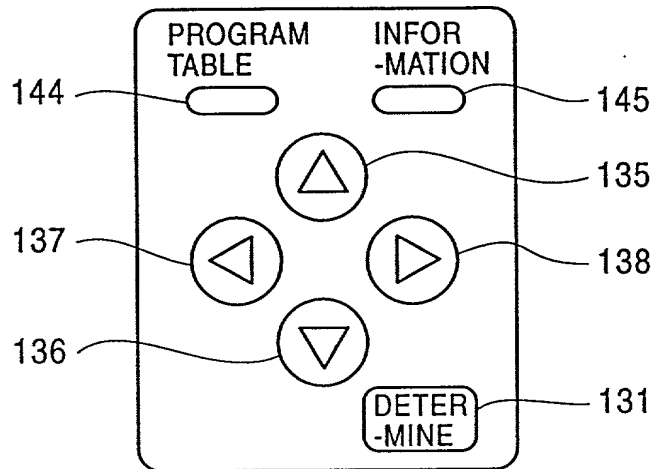


FIG. 26

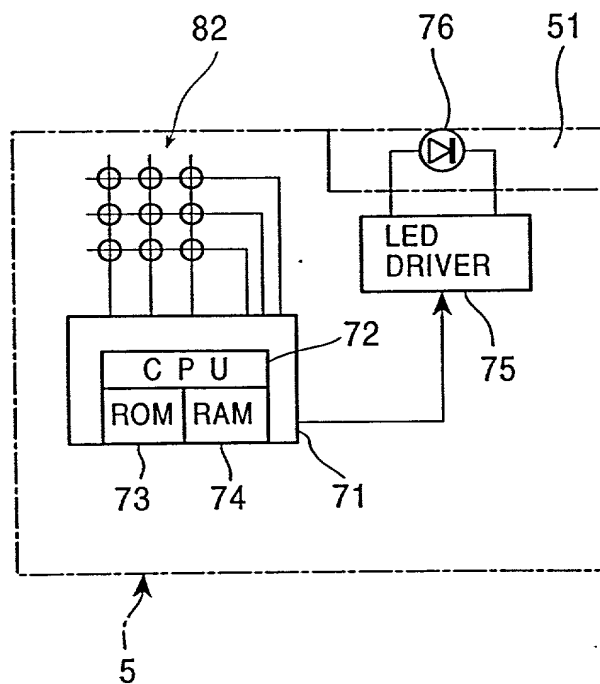


FIG. 27

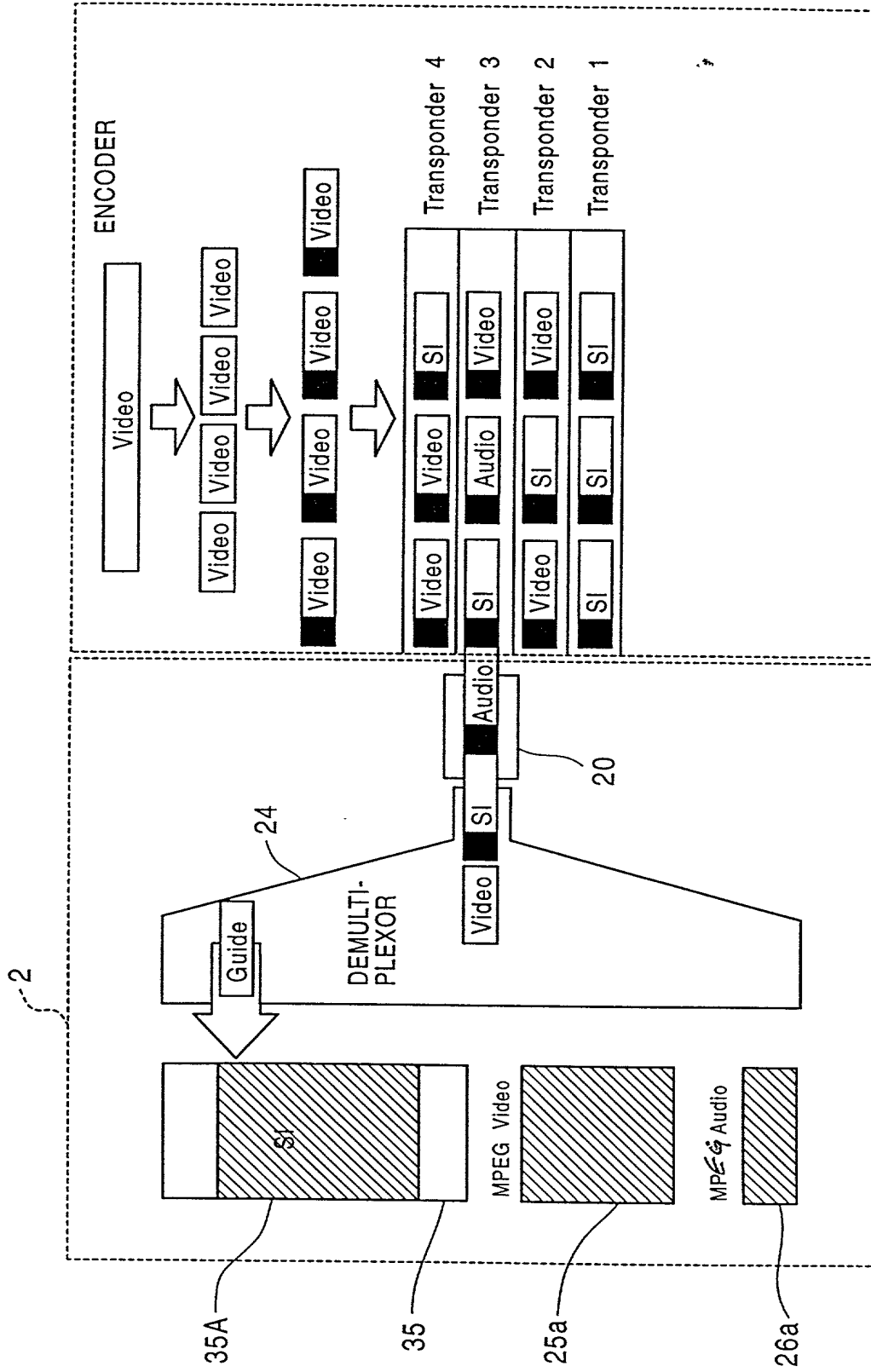
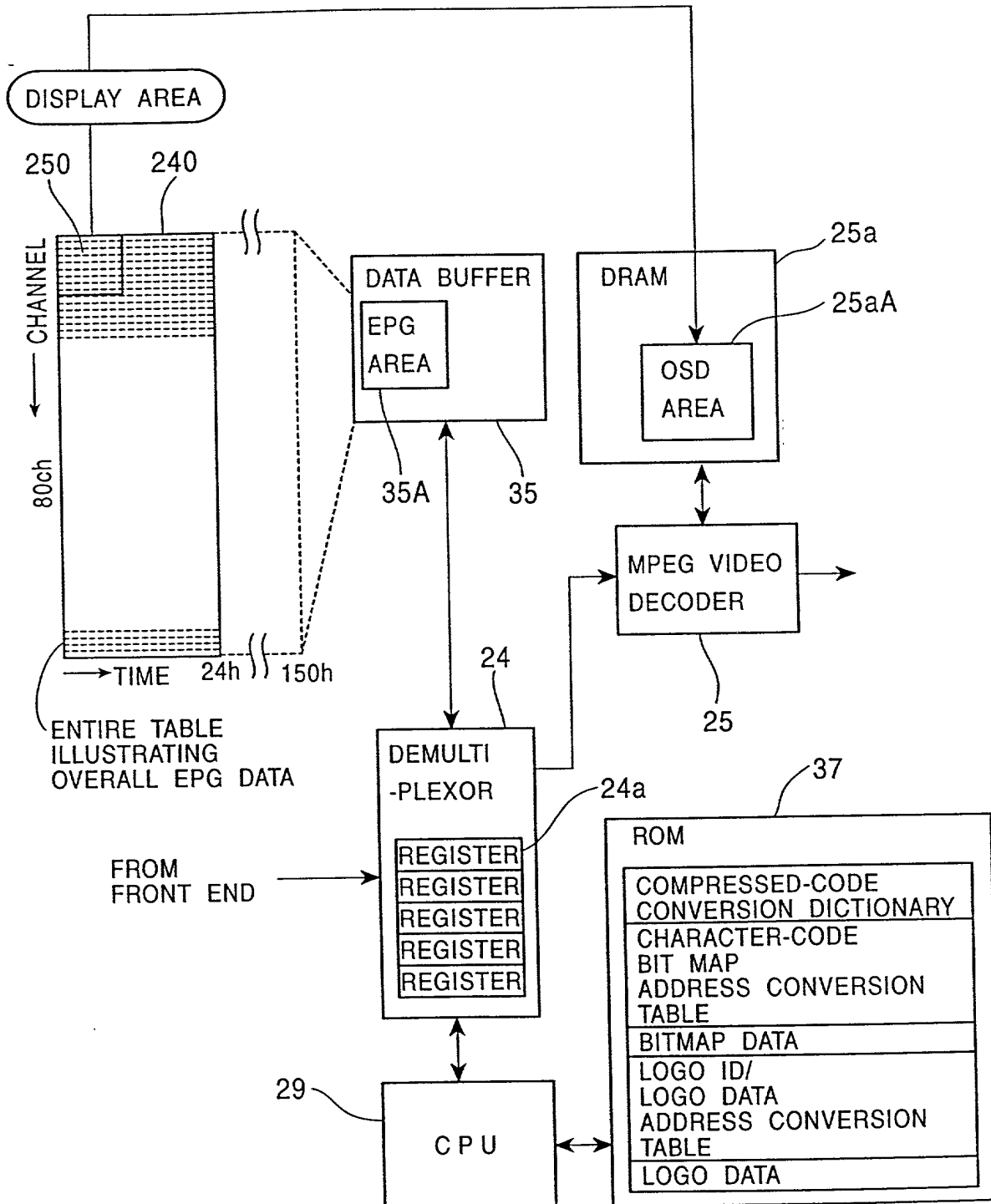




FIG.28





09/6/96

**DECLARATION FOR PATENT APPLICATION (JOINT OR SOLE)**  
**(Under 37 CFR § 1.63; with Power of Attorney)**  
**CURTIS, MORRIS & SAFFORD, P.C. File No. 450100-3598**

As a below named inventor, I hereby declare that:  
My residence, post office address and citizenship are as stated below next to my name,  
I believe I am the original, first and sole inventor (if only one name is listed below) or an  
original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed  
and for which a patent is sought on the invention ENTITLED:

**ELECTRONIC PROGRAM GUIDE SYSTEM USING IMAGES OF REDUCED SIZE  
TO IDENTIFY RESPECTIVE PROGRAMS**

the specification of which

\_\_\_\_\_ is attached hereto.

X was filed on July 12, 1996 as Application Serial No. 08/684,387,

with amendment(s) through \_\_\_\_\_ (if applicable, give dates).

I hereby state that I have reviewed and understand the contents of the above-identified  
specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information  
known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign  
application(s) for patent or inventor's certificate listed below and have also identified below any foreign  
application for patent or inventor's certificate having a filing date before that of the application on  
which priority is claimed:

<u>Prior Foreign Application(s)</u> [list additional applications on separate page]:		<u>Priority Claimed:</u>	
<u>Number:</u>	<u>Country:</u>	<u>Filed (Day/Month/Year):</u>	<u>Yes</u> <u>No</u>
07-183929	Japan	20/07/95	x

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States  
application(s) listed below and, insofar as the subject matter of each of the claims of this application is  
not disclosed in the prior United States application in the manner provided by the first paragraph of Title  
35, United States Code § 112, I acknowledge the duty to disclose to the United States Patent and Trademark  
Office all information known to me to be material to patentability as defined in Title 37, Code of Federal  
Regulations, Sec. 1.56, which became available between the filing date of the prior application and the  
national or PCT international filing date of this application:

<u>Prior U.S. Application(s)</u> [list additional applications on separate page]:		
<u>Appln. Ser. Number:</u>	<u>Filed (Day/Month/Year):</u>	<u>Status (patented, pending, abandoned):</u>

I hereby appoint WILLIAM S. FROMMER, Registration No. 25,506,

and ALVIN SINDERBRAND, Registration No. 16,313, and  
CURTIS, MORRIS & SAFFORD, P.C., Registration No. 12,761, or their duly appointed associate, my attorneys,  
with full power of substitution and revocation, to prosecute this application, to make alterations and  
amendments therein, to file continuation and divisional applications thereof, to receive the Patent, and to  
transact all business in the Patent and Trademark Office and in the Courts in connection therewith, and  
specify that all communications about the application are to be directed to the following correspondence  
address:

WILLIAM S. FROMMER, Esq.  
c/o CURTIS, MORRIS & SAFFORD, P.C.  
530 Fifth Avenue  
New York, New York 10036

Direct all telephone calls to:  
(212) 840-3333  
to the attention of:  
WILLIAM S. FROMMER

I hereby declare that all statements made herein of my own knowledge are true and that all  
statements made on information and belief are believed to be true; and further that these statements were  
made with the knowledge that willful false statements and the like so made are punishable by fine or  
imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false  
statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR(S):

Signature: <u>Tomohisa Shiga</u>	Date: <u>November 6, 1996</u>
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Note: In order to qualify for reduced fees available to Small Entities, each inventor and any other  
individual or entity having rights to the invention must also sign an appropriate separate "Verified  
Statement (Declaration) Claiming [or Supporting a Claim by Another for] Small Entity Status" form [e.g. for  
Independent Inventor, Small Business Concern, Nonprofit Organization, individual Non-Inventor].

PATENT  
450100-3598

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**CHANGE OF CORRESPONDENCE ADDRESS FOR PATENTS**

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Date of Deposit November 1, 1999

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Charles S. Frommer  
(Typed or printed name of person mailing paper or fee)

Charles S. Frommer  
(Signature of person mailing paper or fee)

Continuation of  
Application No. : 08/684,387  
Filing Date : July 19, 1996  
First Named Inventor: Tomohisa SHIGA  
Case Number : 450100-3598

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Please change the Correspondence Address for this application to:

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I am the attorney of record.

Typed or Printed

Name: William S. Frommer, Reg. No. 25,506

Signature: William S. Frommer

Date: November 1, 1999